ORGANIC GARDENING

JUNE 25¢ 1946

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Organic Gardening

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With The Editor

v.9 no.1-6

Do Chemical Fertilizers Increase Yields?

WHEELER McMillen, editor-in-chief of the *Farm Journal* made a speech before the National Council of Farmer Cooperatives in Chicago on January 8, in which he compared farm crop yields in the period of 1894 to 1919 with the period 1919 to 1944. The statistics show that there has been a progressive increase in the use of chemical fertilizers since World War I, and that in the prior period only a small fraction of synthetic fertilizers was used. Yet, says McMillen, "The apparent result of considerable governmental expenditure, plus other efforts, is that we are falling a trifle short of holding our own in national average production per acre. Plant diseases, the insects, the forces of erosion and declining fertility are setting the pace."

Mr. Cary A. Rowland who sent me the printed copy of editor McMillen's speech wrote, "Our progress in agriculture appears to be solely in per capita production due to mechanization." McMillen is up in arms over the figures because the Government in the eight years before World War II spent over twelve billion dollars "for purposes which were described as intended to be beneficial to agriculture."

Suppose the Government had spent half this amount in that eight year period, only four billion dollars, to make compost or to reclaim or reprocess organic residues of industrial plants and farms, and to give it free of charge to farmers? There would be less soil erosion, less disease, less need for spending billions on agricultural research and finally increased farm yields, because actual results on organically run farms show that after a few years yields increase substantially.

But McMillen, in his speech, said not a word about the questioned value of chemical fertilizers in increasing farm yields and how the actual figures give the lie to this notoriously popular deception and fallacy.

●

THE SARGASSO SEA

This leads up to the second item, a letter received from Chicago which I am going to reproduce here in its entirety. It shows one place where the Government could spend part of this four billion dollars to get much needed organic matter for the farmer.

This is, at least, one answer to those who doubt if there is enough organic material available to go around on all our farm acreage. Even if the mining of sea organics were not economical at this time, it could be approached by government subsidy, since sooner or later we shall have to replenish the organic content of the soils. After all, soil erosion and sewage disposal sends much of our organic fertility into the oceans and feeds the plant life there; why should we not recover part of it

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and return it to the land?—And here is the letter:

Chicago, Ill.
April 3, 1946

Dear Sir:

If it is compost you are wanting, why don't you organize a company to harvest the Sargasso Sea?

You could buy up surplus war-built freighters and equip them with giant wringers to wring the stuff dry as it is loaded. (You could even fire the ship's boilers with the material—saving the ashes to mix with the compost.)

Your ships could put in at New Orleans and transfer the product to barges for transportation to the heart of the farm belt. After the St. Lawrence seaway is completed, you could float your loaded barges down stream from Great Lake Ports.

I give you the idea to play with free of charge and with best wishes.

Your truly,
William Herrington

Here is what the Encyclopedia Britannica has to say regarding the Sargasso Sea:

SARGASSO SEA

Sargasso Sea, a tract of the North Atlantic Ocean covered with floating seaweed (Sargassum, originally named Sargaso by the Portuguese). This tract is bounded approximately by 25° and 30° N. and by 38° and 60° W., but its extent varies according to winds and ocean currents. By these agencies the weed is carried and massed together, the original source of supply being probably the Caribbean Sea and Gulf of Mexico (see Algae). Similar circumstances lead to the existence of other similar tracts covered with floating weed, e.g. in the solitary part of the Pacific Ocean, north of the Hawaiian islands, between 30° and 40° N. and between 150° and 180° W. There is a smaller tract S. E. of New Zealand; and along a belt of the southern ocean extending from the Falkland Islands, south of Africa and south-west of Australia, similar floating banks of weed are encountered. The Sargasso Sea was discovered by Columbus, who on his first voyage was involved in it for about a fortnight. The widely credited possibility of ships becoming embedded in the weed, and being unable to escape, is disproved by the expedition of the "Michael Sars," under the direction of Sir John Murray and the Norwegian government, in 1910, which found the surface covered with weed only in patches, not continuously.

Mr. Herrington sounds as if he has nautical experience and even his name has a sea-going tang. His letter is so full of enthusiasm that you feel like going right out and buying a boat, but unfortunately we here at *Organic Gardening* must keep our skirts clean and must not become involved in the commercialization of the various phases of organic farming or gardening. If we would, that would give our opponents ammunition with which to attack us. They would say that *Organic Gardening* is merely a house organ to push our other commercial interests. The Department of Agriculture should send out an experimental boat and publish the costs of the venture so that individuals and companies could then enter the field. At first it may not be necessary to go to the Sargasso Sea. There are good sources closer to shore. I have often thought that some day some enterprising individuals with a dash of adventure in their make-up would do just such a thing and who knows? Perhaps there may be money in it? I know that we have a few millionaire readers on our list. Will one of them please buy a boat?

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ORGANIC PAPER TOWELS

Mr. Herrington is not the only one who is willing to give away an idea free of charge. I have an idea that any paper company can adopt without paying me a nickle of royalties. Why couldn't paper towels be made of such innocuous ingredients that

after it has served its first purpose it could then be placed in the compost heap to decay. Cheaper papers are made basically with wood pulp from trees and do not require the chemical bleaches of the fine white papers. I put the proposition to the world's largest manufacturers of paper towels and in a letter to them stated "offhand this might seem like a ridiculous idea but you would be amazed at the interest of gardeners in their bit of ground." I was surprised when they wrote back. "The idea you present to us in your letter of August 18 does not sound at all ridiculous—it sounds quite plausible and possible." The idea is open to all.

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NOW YOU SEE THEM NOW YOU DON'T

For the past few years we have been growing our winter vegetables in a hot house where the plants grow right on the ground. There are no raised benches. In December the lettuce especially was hopelessly invaded by aphids. My gardener and I held a council of war. What should be done? We run the hot house in the organic way. We use only composts and do not spray, but you cannot hope to get optimum results in so artificial a place as a hot-house.

The light has to come through glass, and you don't have free circulation of air. Plants are made to be swayed by gentle zephyrs. This action may contribute to its well-being, just like a human reacts beneficially to the taking of exercise. In a hot-house through this lack, who knows, some of the plants may be suffering from rheumatism. But there we were and the aphids were sucking the life out of the lettuce. The gardener was all for spraying with a "safe" nicotine insecticide. But I wouldn't approve. While this form of spray can hardly be considered a poisonous material, yet it has sufficient strength to kill aphids. Possibly, it also has a discouraging effect on soil bacteria. If it came to that, I would rather have no lettuce at all. The aphids weren't attacking our carrots or beets or radishes.

A few months went by. Came March. One day I noticed a peculiar fact. There were no aphids on the lettuce and they were growing in the very same spot where these little ant-cows had their previous field-day. There could be only one answer when we investigated. The lettuce was twice the size of those that had been troubled in December. They looked more vigorous and of a finer color. They seemed to be of thriving health and either could resist the aphids or, and what seems to me to be the true answer, their health gave their tissue a taste that was not tasteful to these noxious bugs. When, for any reason a plant is not healthy, the processes of nature begin to act to destroy it. That is part of Nature's or God's plan, and insects are one of the means used to accomplish that purpose. The more you think about it, the more you see it.

But why was the December lettuce so poor and the March lettuce so fine? I believe the answer to that is that in December the days were so short that the plants had less light and it so happened also that during that month there was practically no sunshine. The days were gloomy and cloudy. In March the days began to lengthen considerably and there were glorious days full of sunshine.

●

LOOK FOR LEAVES

Before the spring season opens and in the event there is a shortage of green matter with which to make compost, it is possible to tap a very valuable source of material which is lying dormant and decaying in odd corners. And that is leaves from previous seasons that have been dumped in out-of-the-way places to get rid of them. During the month of February on our farm we were continually making compost and getting old leaves

from nearby woods, ditches, roadsides, etc. There seemed to be an endless supply and it was a life-saver because we had completely run out of our reserve of withered weeds and spoiled hay.

I prefer leaves to the general run of other forms of green matter because the roots of trees go down more than twenty-five feet and are terribly determined to get nourishment. They bring up minerals from unexhausted strata of soil which show up in the leaves. I have noticed in a nearby city where there are houses on one side of the street and open lots on the other, that for years the householders have been dumping their leaves on the open lots and I was amazed to find piles of them in various stages of decay. It was just like discovering a gold mine.

J. I. Rodale

Organic Methods For Getting Potash

PROFESSOR LANG of the University of Illinois wrote in *Better Crops with Plant Food* about an interesting experience with loam soils of his state. These soils had large amounts of potassium, but the important plant nutrient had to be made first available to growing plants. This was done by growing legumes on the land and turning under the growth. Thus, the potash was in organic form and other plants responded quickly, though, of course, the potash source was not inexhaustible. But the principle is valid just the same and is another support for the compost theory. The article of Professor Lang may be had from *American Potash Institute,* 1155 Sixteenth Street, Washington 6, D. C.

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South Africa Leads the Way

By SIR ALBERT HOWARD, C.I.E.

SOUTH AFRICA has led the British Empire and indeed the world in recognizing the place of compost making in any well founded and progressive system of agriculture. The work of the compost-minded pioneers among South African farmers has spread like fire over the whole Union with the inevitable result that research work of real value and importance is now in progress.

In the *Farmer's Weekly* of Bloemfontein of December 6th, 1944 an article composed from shorthand notes left by the late Mr. D. J. Hamman describes the results achieved by research workers at Tabamhlope Pasture Research Station under the supervision of Mr. J. D. Scott. This Station is situated at an altitude of almost 5,000 feet in a locality with a heavy annual rainfall, where in former years it was believed that the veld could be utilized for grazing during only three to four months in spring and summer, and for the growing of potatoes. The soils were inherently poor and farms which were in production for twelve months in the year wore out after five or six years of cultivation. The Tabamhlope Research workers set out to solve the problems of how to manage the veld and conserve feed so that live stock could be carried the whole year round, and how to build up and maintain fertility so as to keep the land productive.

Veld-burning experiments were carried out, but the method of removing the old veld grass was found to be by a mower at the end of the winter. This gave earlier grazing in most seasons and much increased yields of hay, besides providing plenty of material for compost making. Veld hay was made by a special curing method adapted to the local conditions of high rainfall, and on this dry hay, matured stock and even young, growing animals could be carried on the veld during the autumn and winter without additional fodder. For breeding and producing stock, however, the veld hay had to be supplemented by crops from the arable land.

This meant tackling the problem of maintaining soil fertility. Preliminary experiments with super-phosphate applied at the rate of 600 lb. per acre produced maize up to only 3 feet in height, and it was found that most pastures could not survive even the first winter. Similar results were obtained with mixtures of artificial fertilizers, but when the land was dressed with compost it was found possible to grow both good crops and good pastures. The soil structure of this worn-out land had been destroyed and the addition of organic matter was the first step in the right direction. Moreover the effects of the compost were found to last for many years.

Detailed experiments were then undertaken on methods of using the compost, from which already interesting results have been obtained. Under the prevailing rainfall and temperature conditions, very heavy applications of compost at long intervals appeared to be more beneficial than continual light dressings, and it was established that if the fertility could be properly restored by means of organic matter, excellent pastures could be produced and good crops of roots, soy beans, and silage maize obtained.

Compost making fits easily into the system of farm management. The mowing of the old veld grass ensures early growth and high yields of veld hay in the spring, while the old grass is carried into the yards in wagons which are used on the outward jour-

ney for carting out the previous year's compost to the fields. This old veld grass is stacked ready for use as bedding in the kraals during the next winter. When the stock are put out to grass again, the dung—and urine—impregnated bedding, after being thoroughly saturated by the summer rains, is made into heaps about 12 feet wide by 6 feet high and 50 to 60 feet long. Fermentation is rapid and after about a month or so, by which time much of the material has broken down, the compost is stored in a big heap until the following spring. The output from 100 animals during the last winter feeding period was some 600 tons.

Pigs kept on a profitable extensive system are also being used in the restoration of depleted lands, and suitable rotations for maintaining soil fertility are being developed.

The veld now supports live stock till the end of February, after which they are turned on to artificial pastures with clovers till the beginning of May. From May onwards a diet of hay, roots, and silage is given, the fodder crops being grown on land whose fertility is built up from compost produced during the winter feeding period or from the extensive system of pig-keeping.

The use of pastures with various mixtures of grasses and clovers not only for maintaining live stock, but also for the building up of soil structure, is under investigation, as well as the effect on soil fertility of different grass leys in a rotation.

Much work remains to be done, but Tabamhlope Pasture Research Station has given a fine lead to future agricultural investigation. Here practice is rightly joined to theory and every problem of veld management is studied in relation to the whole issue. Those modern research organizations, in which each piece of investigation is carefully divorced and segregated in a separate compartment from every other line of inquiry, may well take to heart the lesson exemplified by compost-minded South Africa's research work. Only by so doing can they ever hope to produce results of permanent value to agriculture and of real benefit to the generations yet to come.

Snap Asparagus In the Field

THE MARCH ISSUE of the *Market Grower's Journal* showed two piles of asparagus tips; on the left was the part that could not be canned, on the right were the tender tips snapped off at the cannery. How much better, says Keith Barrons of Michigan State College, to leave the useless parts in the field. It saves so much time to canneries that some of them offered to their growers twice the price per pound of field-snapped asparagus that they gave for ordinary asparagus. The organic gardener welcomes that suggestion—you leave that much more organic substance in the ground and with the plant, enriching thereby next year's crop. The plant is less seriously taxed and keeps part of this year's growth as reserve food for the following year.

HARVEST TIME **H. C. White**

This August view of one of the heavy bearing vines could have been duplicated for more than 60 days during July, August, and September, 1945. The leaf mulch has almost disappeared, but the vigorous new canes provide shade for the growing earthworm population.

Building Topsoil With the Common Gray Earthworm

By HERBERT CLARENCE WHITE

50 Earthworm Egg Capsules and 60 Young Worms in one Handful of Topsoil After 18 Months of Organic Gardening Procedure!—

That, in brief, is the remarkable experience of Herbert Clarence White of Gardena, California, reader of *Organic Gardening Magazine.* Mr. White's story follows:

IN the Spring of 1944, I spaded up a little patch of ground 21 x 24 feet in the back portion of my city lot for a Boysenberry patch. During the preceding Winter a heavy crop of weeds had grown up on this plot, and the ground, after removing the weeds, was hard and dry. The soil had to be flooded before spading was possible. Not a single earthworm could be found in this hard adobe soil.

I had no compost humus of my own at that time with which to enrich the soil and increase its friability, so I purchased several bags of so-called "composted" steer manure, and a bale of peat moss. I mixed the two, and placed several shovel-fulls in each of the 30 holes, which in turn was mixed thoroughly with the upper 12 inches of soil taken from each hole. I then planted my young rooted tips.

The berry vines made average progress throughout the Spring and Summer. The following Autumn my first compost heap, built according to Sir Albert Howard's specifications was "finished" and ready for the soil. At that time I spread a 2-inch layer of this compost humus over my berry patch and forked it in lightly. At this time also I became interested in mulching; and with a borrowed trailer I gathered elm leaves from one of our city streets, and spread them evenly over my little patch to a depth of from 3 to 4 inches. Not a single weed showed its head during the Fall, Winter, and Spring months. The leaf mulch smothered out even the "devil-grass" and wild morning-glory, which for years had flourished in this area.

As the growing season advanced, the berry vines made an excellent showing in spite of no cultivation of any kind or irrigation. (See illustration). During July and August a splendid crop of superior quality was harvested. With no rainfall from May until December of 1945, frequent irrigation was necessary in all berry patches on nearby farms. However, my soil, under the leaf mulch remained in perfect condition. It was examined periodically for moisture content, and even in the upper two or three inches there was no indication of drying out. No watering of any kind was done until after the berry crop was harvested.

However, by late August, the earthworm population had devoured the leaf mulch, with only thin skeletons of leaves remaining on the surface of the patch. Then, and not till then, did the soil begin to dry out, and it was necessary for me to sprinkle twice before this last season's leaf crop fell, and became available for a second application of mulch.

Early in October the elm trees on Denker Avenue were again shedding their leaves and seed pods. And again I spread from 3 to 4 inches of "earth-

GIRLS AND BERRY VINES H. C. White

Shortly after harvesting the 1945 crop, the old canes were cut away and the new canes were trellised. No thinning out or pruning back was attempted. Some of these canes were from 15 to 20 feet in length, and after trellising in September there was additional growth up to four and five feet on many canes. This early October view was made shortly after the second elm leaf mulch had been applied. Note again absence of weed growth in the patch.

worm food" over the entire patch (See illustration). At this time I observed a thin layer of black topsoil, spoken of so often by earthworm enthusiasts, but never before seen by this observer during his 50 years of residence on the "good earth". This thin layer was from one-fifth to one-quarter of an inch in depth, with a texture as smooth and lovely as velvet. I began to realize in my own garden the dream I have had ever since becoming an Organic Gardener—of "the soil you love to touch".

At Christmas time, four months later, I observed under the leaf mulch a tremendous increase in these black velvety-like castings, indicating great activity in the soil as well as a phenominal increase in the earthworm population. In February (1946) I decided to prepare a "flat" for flower seedlings, and having read that in these black earthworm castings I had the richest and finest plant-food known to Agriculture, I sifted out on a fine screen about two quarts of topsoil from the berry patch.

To my complete surprise, I found remaining on the surface of the screen hundreds of wriggling baby earthworms and earthworm egg "capsules". From another part of the patch I took a second two quarts of topsoil from the upper layer of castings, which by now averaged from 1 to 1½ inches in depth. (See illustration). Again I was rewarded with a large number of tiny worms and eggs. By now I was becoming really excited about my "find". So I took from various parts of the berry patch a pint of soil, and carefully counted both eggs and baby worms from each "take". The results were almost breath-taking. One pint of soil yielded 150 egg capsules and nearly 100 baby worms! One handful (see illustration) yielded

51 eggs and 60 young worms! The average over the patch, however, approximated 50 earthworm eggs and 50 worms to each pint of soil sampled.

The approximate average per square foot of soil was 350 eggs and 350 capsules. In this little berry patch in a corner of a city lot (504 square feet) we have therefore, a total of 175,000 baby worms, with an equal number of egg capsules in the upper 1-inch of top-soil. Maintaining this average in a berry patch 100 x 350 feet, there would be 12,250,000 baby worms and an equal number of egg capsules!

Earthworm authorities tell us that from each egg, there will emerge within 21 days from 3 to 20 baby worms. Also, that adult breeder worms will pass an egg capsule every 7 to 10 days. At this rate, astronomical figures can be obtained in a very short while, even in a tiny patch like mine. Remember, not a single worm or egg capsule was planted in this soil. Unwittingly we spread a "table in the wilderness" of "barren soil" in the form of simple fallen leaves, and the earthworms moved in, and how they moved in! These are not domesticated "breeders", but the common gray angle worms which we used to hunt on our fishing trips.

We have not attempted to estimate the number of adult worms deep down in their burrows. Heaven only knows there must be a lot of them to produce such spectacular results as building an inch and one-half of top-soil in a single year. In my reading (and I have read everything I could lay my hands on concerning the earthworm) I have failed to find any mention of earthworm castings in excess of one-fifth of an inch per year. Twelve months ago there was no visible trace of these castings in my soil. Today I have, as previously mentioned, up to 1½ inches! It may be that unwittingly I have established in my little garden something of a record in the propagation of the wild undomesticated earth-

H. C. White Photo

A HANDFULL OF EARTHWORM CASTINGS CONTAINING 51 CAPSULES AND 60 YOUNG WORMS

A February, 1946 view revealing a tremendous increase in the earthworm population under the leaf mulch. Note again continued absence of any grass or weeds in this patch.

H. C. White Photo

1½ INCHES OF PURE EARTHWORM CASTINGS IN 12 MONTHS

A remarkable, almost life-size view of the heavy layer of earthworm castings found under the leaf mulch in this patch. The ruler is resting on the ground level. Black, velvety castings reach up 1½ inches from the ground level. Note the crumbly appearance of this rich topsoil.

worm. I would like to hear of anyone who can top it.

An estimate of the weight of these castings in my berry patch reveals the fact that I have approximately 3,500 pounds of this black, velvety colloidal humus in this spot only 21 x 24 feet, with no work involved in composting, no weeding, no cultivating and practically no watering. Truly, harnessing the earthworm is a worthwhile hobby for any farmer or gardener. All one has to do, is "feed the brutes"—and nature will take her course.

BLOSSOM TIME IN THE BERRY PATCH H. C. White

Dorothy Mae examines the Boysenberry blossoms with their promise of fruitage. Note the young canes making their way across the heavy leaf mulch. This view shows the berry patch 15 months after planting. Note absence of any grass or weed growth.

Successful Results in Germinating Seeds Without Chemical Fungicidal Control

By PAUL PFUND

THERE seems to be an ever increasing hue and cry for more and more effective measures of control of destructive fungi especially as pertaining to the germinating of seeds. I am profoundly but unfavorably impressed by this. Of course there is nothing organic about fungicides but how, we ask, are we to overcome the commonplace attacks by fungi often resulting in complete destruction of our finest and most cherished seedlings. My attitude toward the use of synthetic chemicals is not necessarily one of disparagement but rather one of caution. I believe as one of my closest and most accomplished medical doctor friends does,—that the entire system of synthetic drugs and medicines is in the experimental stage. It is possible then that some day we may emerge with the correct formulas.

I might be considered humorous in saying that I am playing the Organic Gardening principle for all it is worth and so, to be thoroughly consistent I practice my philosophy at the outset, and that is to avoid the use of fungicides in the *Seed Bed* if at all possible. In the last ten or more years I have used a total maximum of but a very few ounces of fungicide in all my seeding combined. The losses in germination in these years have been negligible and occured only as a result of momentary laxity on my part in the matter of proper soil selection, and scrupulously clean soil culture. To put it in a sentence, I am having what to me are remarkably satisfactory and consistently uniform results. This I attribute to a strict observance quite specifically, of what I like to think of as six factors of a sound principle which is not at all complicated but nevertheless very exacting.

It is quite commonly accepted that sphagnum moss very finely shredded is an excellent substance for a seeding surface. I use peat moss also, or sometimes I mix the two. I am inclined to believe that sphagum moss is especially valuable because of an undetectable presence of some form of helpful bacteria or beneficient fungi therein. The six factors are:

1. A scrupulous selection of clean soil specifically for the seed bed.

2. Proper composting and special treatment of the soil immediately prior to seeding.

3. Care not to sow seeds too thickly (some exceptions).

4. Scrupulous observance in the matter of covering seeds.

5. Proper control especially of surface moisture during the germinating period.

6. Providing as nearly as possible a natural atmospheric condition through ventilation and a properly selected and installed heating system.

And now to enlarge on each of the foregoing six factors. Modifications may of course be necessary in some respects depending upon climatic conditions and location.

1. In many years of close observation I have never found the equal of compost made with Blue Grass Sod as the soil element. Where compost is not available the use of soil directly

under the sod (not deeper than three to four inches) will serve admirably for seeding purposes. It is not comparable with compost but is a good substitute.

2. The proper composting and mixing with other ingredients such as Rock Phosphate or Colloidal Phosphate, sheep or cow manure and sometimes lime and sand, (see "Compost, and How To Make It") fowl and goat manures are also acceptable, but sheep manure is "tops" in my experience. The older the compost the better. The portion for immediate use should be subjected to a temperature of not less than 50 degrees, preferably nearer to 70 degrees for four or five days with average moisture content. My observations seem to indicate that this will especially encourage the germination of noxious weed seeds, and what may seem strange to say, cause harmful fungi to become active only to be seriously enough disturbed in the final screening of the soil for the seed bed so that the seedlings will naturally overcome later fungicidal action which might be harmful. This statement is based on my control on occasion of fungi in the seed bed by the mere stirring of the soil resulting in aeration.

3. Scrupulous care in not sowing seeds too thickly. (Some exceptions). Thick growth of plants tends to reduce normal aeration which in itself is a powerful controling factor in many respects.

4. Careful attention to the matter of covering seeds. Much seed as sown by amateurs and even some so called professionals is really buried and is therefore consequently rendered impotent. Fine seed of any kind rarely needs covering if sphagnum or peat moss is used as a *seeding surface.* This should not be firmed in the least. Coarser seeds should be covered in proportion to size and virility. The covering material should always consist of finely sifted soil mixed half and half with fine sand unless the soil is naturally sandy. To this may be added an arbitrary amount of peat or sphagnum moss. In principle this holds for outdoor seeding as well but other factors enter here which should be observed to local conditions.

5. The matter of moisture is of supreme importance but can be readily controlled if the necessary yet simple equipment is available. The *seed bed* whether flats or otherwise should be thoroughly soaked just prior to sowing. Immediately after watering the "seeding surface" for fine seeds should be applied to a depth of approximately three-eighths of an inch. This is not to be pressed down but watered with a fine mist spray after seeding. (For it is to the tiny particles of moss that the first tender hair-like rootlets anchor themselves while the so-called tap root is developing for descension into the soil proper). Then cover with glass allowing a small opening for aeration. Glass should be suspended not less than three-fourths to one inch above seeding surface. Most fine seeds thrive better with defused light while germinating and some require this condition even longer, while the coarser seeds rarely need shading.

6. Ventilation or a proper atmospherical condition is another powerful factor. Destructive fungi usually flourish under dank conditions. A gentle flow of fresh air of proper humidity and temperature (60-70 degrees) is an imperative requisite. I have what is possibly an innovation in heating apparatus in my greenhouse. We use free circulating warm air in place of the convential coils of steam or hot water. Properly or otherwise, I attribute much of my freedom from fungicidal attacks (damping-off) to this fact. The heat is applied overhead entirely: natures own way. In discussing this very feature recently with a friend who is making a careful study of insecticides and fungicides he stated that the convential types of heating systems are highly conducive to the propagation of destructive fungi and bacteria.

My thoughts keep recurring to the principle of Organic Gardening and

the question arises, why should this principle not be applied at the outset in all of our soil and plant culturing. Could it be that what seems a difficulty is after all really an indictment of our own neglect and ignorance of, or indifference to sound cultural principles? Much soil sterilizing with chemicals and steam is practiced. I use neither of these. Perhaps nature is flashing the "red light" warning us to mend our ways. Shall we heed?

EDITOR'S *NOTE*: We call also attention to Evelyn Speiden's new booklet "Seedlings", which just appeared in the *Gardener's Book Club*. Miss Speiden is well-known to our readers through her herb article and her geranium growing, and here discusses the treatment of seeds and seedlings in house and garden.

Cutworms

CUTWORMS ARE NOT REALLY WORMS, but the larvae of some night-flying moths. They have destroyed and continue to destroy millions of dollars worth of crops all over the world every year. Some live in dry regions, others in moist and even flooded land. They attack everything from corn and tobacco to the crops in the garden, and the varieties and their habits are so many that none can be successfully combatted. Some lay eggs under trash, others on fence posts. The best way of catching cutworms in flower beds is to look for their damage and to dig them up. You can find them in the loose soil where they bury during the day. For the majority feed during darkness. Young vegetables can be protected by a band of paper sunk around the stem and extending a bit above ground. This forms a barrier, since cutworms do not dig deep or climb high. Vegetables sown in the open are sturdier and less apt to be felled than transplants, and certain varieties are less likely to be attacked than others. Savoy cabbage and kohlrabi do not seem to be so palatable when green cabbage and cauliflower are around. Kale is hardly ever attacked. Thus it is especially the various cabbages that must be protected by bands. This is a case where even the advocates of chemicals have to resort to cultural methods, for the poison baits do not appeal to the majority of these larvae.

Murdered Bread

"THERE IS A PENALTY for watering milk, but no penalty for the worse crime of murdering bread. The greatest single cause of our malnutrition is taking the living wheat germ out of our flour. The best food reform would be to get the germ back into our bread again." Geoffrey Bowles in *Daily Sketch*, January 22, 1946.

Garden Calendar --- June

North Temperate Zone: June is the month when you want to consider garden plans for next year. Now is the time to start a perennial seed bed; get enough growth so that you can have a good perennial border next year. Get new seed if possible, since most perennials are not so long lived in their seeding stage as we might wish. Also sow biennials, such as dianthus, campanula, columbines, hollyhocks, etc.

You can still sow annuals for later blooming, for instance, poppies, snapdragons, mignonettes, zinnias, etc. and you can set out some more gladiolus and tritonia, commonly sold as montbretia.

Now you sow vegetables for winter storage or, if your climate permits, outside growing. You can still start chives, sow onions, turnips, rutabagas, cabbages, beets, radishes, late beans and limas, broccoli, etc.

Time to mulch potatoes, tomatoes, cucumbers, pumpkins, berries, especially raspberries. Give compost topdressings to the vigorous growers, such as tomatoes, cucumbers, pole beans, egg plants, peppers.

Start endives; when you plant, do so in the evening or on cloudy days. If you like kale, now you can start sowing it. It is hardy and will give you a crop early next year, but you can sow it still later. Try Savoy cabbage, which is a perfect fall crop and the most delicious of the cabbages, when properly prepared. You can also sow spinach if you have a cool or shaded spot; you must sow leek before the end of the month in order to get good enough results.

Cultural practices for June include above all the loosening of the soil by hoe or row cultivator. In the flower garden, tying plants, cutting off the stalks of dead flowers, transplanting primulas, dividing and making cuttings of wall flowers, carnations, oleander, and many other shrubs are best done in June.

If you sow carrots, lettuce and winter radish, from now until the first week of August, be sure to keep the seed beds well moistened until the seeds have germinated. When you water elsewhere in the garden, do it thoroughly a few times rather than casually many times. Frequent watering requires frequent loosening of the soil.

The question of morning and evening watering is not so serious at this time of the year, when the night temperatures are high. On very hot days when evaporation is high, it may be better to water in the evening and to give the plants a chance to pep up during the night. Otherwise, watering in the morning is fine.

Southern Gardens: Set out gladiolus, montbretia, and tuberoses. The latter may be given compost dressing, the former not. Time to sow portulaca. Try the new varieties which are large-sized. Sow cosmos and all other composites, like zinnia, marigold, for later bloom, and put out some of the annual vines if you have not done so. Cypress vine makes a good bedding effect when sown in a mass. But try especially Thunbergia on a shadier wall or trellice.

New lawns can soon be started again, both St. Augustine and Bermuda are transplanted now and through the summer. But soak well rather than frequently.

If you have some of the good new petunias, you can layer them, covering the slips well with earth. If you do it in semi-shade, on the North side of a building, you can get petunia stems to root even though they are in flower.

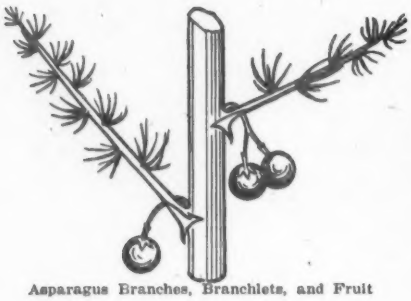
McFarland

June Thoughts About Flowers and Vegetables

By HEINRICH MEYER

JUNE is the month when cut flowers become more abundant. It is not always easy for the flower lover to cut a living thing. After all, the flower is an organ of the plant organism, the organ which displays the best of the beauty, fragrance, color, and formative powers of which the plant is capable. It belongs to the plant, but we want to take it inside and gaze at it. If we leave the flower outside and let it mature, it will, in most instances, become pollinated and produce seed. If we cut it, the plant will send forth new flowers to make up for the loss. This is why many gardeners extend the flowering period and increase the profusion in their garden by keeping the flowers cut or taking out faded flowers before they can develop seeds.

June is also the month when, almost everywhere in the country, no more asparagus should be cut. Now the shoots are allowed to come up and develop into those lacy trees or treelets which will then display hundreds of small yellowish flowers, the male flowers on one plant, the female flowers on another. When fall comes, the latter will be sprinkled with small red berries. And if then you cut down the dried asparagus straw to use for a mulch on roses or vinifera grapes, your beds will be sown with the small onion-like seeds and hundreds of pretty little asparagus plants will issue forth next spring. But suppose you cut the treelets down before they have flowered; would you then get more asparagus next year? Would the



Asparagus Branches, Branchlets, and Fruit

strength of the root be better preserved?

These two questions came to my mind as I looked about me and thought of the usual June developments. Quite a few gardeners may have put the same questions to themselves: Is it better to cut or is it better to let grow?

Before we come to the answer, let us first see what we do to the plant and what these growths mean to the plant. It would be probably an error to think that a man wears a good suit of clothes to impress the opposite sex and that a woman buys a stylish hat to impress an eligible male. The man, if I may speak for myself, buys the kind of suit he has always bought if he can afford it and does not really care what other people think about it, if he likes it himself. In fact, he is a bit embarrassed and is made to feel childish if his associates recognize the new suit as new and make a remark about it. Not having been a woman I really do not know how a stylish hat feels, but I am sure that other women are more apt to notice its quality and significance than even the most admiring men. What I am driving at is simply this, and it is rather important: We buy suits and hats not exactly as symbols of our male and female characters, but because we like them, want them or otherwise think we ought to have them. There is a school of sociologists and anthropologists who reduce everything to sex attraction. People dance and sing and whistle and wear clothes to emphasize their sex characters. Unconsciously, subconsciously, perhaps? I doubt this, too. For if there were a definite subconscious appeal in stylish hats, I am sure the bill board advertisements would show us more stylishly hatted girls holding soft drinks and cigarettes. But they usually display the more natural beauties of waving hair and wind-blown curls. Only where respectability and comfort are to be displayed, in automobile, insurance and liquor ads, do we find the apparel emphasized. Here mutual attraction of boys and girls is not even hinted at. What has that got to do with the flower and vegetable garden in June? Quite a good deal.

We cannot definitely say that men and women make themselves beautiful or what they consider as such for the purpose of attracting one another; but we know men and women. We know, on the other hand, very little about what goes on in plants; still we have reasoned by analogy that they make beautiful flower displays to emphasize the purposes of reproduction. The flowers are, of course, sex organs. But they are also very beautiful, the most beautiful part in most plants, if our own opinion counts anything. Does this beauty then have a direct bearing on the function of the flowers? Are the flowers beautiful for a purpose? The school of popular biologists who interpret everything very quickly and glibly in terms of purpose say

McFarland

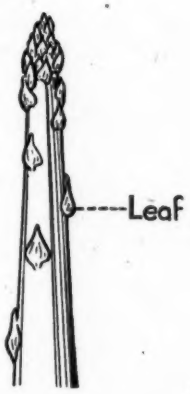
"yes". *We* can only say that we know no more about the reason why flowers vary so much than we know why ladies wear gloves. I think a hand is infinitely more attractive than a cover made of kid skin. And to judge from the perfume of some flowers, let's say the stapelias, their taste is not always good. The variety of colors, the variety of shapes, the variety of scents is so enormous that it is a bit difficult to reduce all of this to one simple problem—make an insect alight so that it carries pollen away and induces seeds. All life is or may be purposeful; it has a drive and a direction; and thus the flowers are not useless; nor are their colors, shapes and fragrances accidental; but nobody can assert that all of that must be reduced to reproduction. After all, many flowering plants get along very well with inconspicuous flowers.

Since many flowers managed to reproduce themselves through the ages without the agency of insects, it may be well to wonder if they really are playing up to insects as much as the Darwinists used to think.

After this intermission, let us return to our problem of the flowers in June. It was found out by Molisch, who used to teach botany at the university of Vienna, that he could make a certain annual plant into a perennial by cutting off its flowers. He never permitted it to bloom and to produce seed and thereby forced the plant to keep on growing. Not all plants can be handled that way, but many, no doubt, can. It would, indeed, be a very interesting experiment if someone planted a grass plant in the middle of a plot of ground and kept it from flowering. How long would it take the grass to cover the ground by tillers and runners?

If, then, we prevent a plant from seeding, we force it into one of two courses: It will either send up more flowers and hope to get them to the seeding stage or it will store up its powers and wait for another season when the gardener with his scissors may overlook it. This is the main distinction between annual and biennial growth habits.

But if you cut off the asparagus shoots altogether and let none develop, then no powers can be stored. The asparagus is a perennial, like most lilies to which it is related. By cutting off its green parts, which from the carbon in the air and with the help of the water and nutrients in the soil and the energy of the sunlight make organic matter, sugars, starches, and other reserve substances, you would simply deprive the plant of its one and only chance at storing up food reserves. You would get a very poor crop of asparagus shoots the following year. For next year's shoots are made from the stored food of the present year's growth.



Asparagus—Shoot and Leaves

When you try to interpret these facts in the light of organic gardening, you cannot but arrive at the fundamental rule of all plant growth and all living existence: It has its own laws and no will can be imposed on it from the outside. You can combine inert matter and pour a concrete block, even though this has its own laws and undergoes its changes in time, but you cannot deal mechanically with growing things. Some you may cut, others you must leave standing.

RESULTS

Dear Mr. Rodale:

We purchased 3½ acres of ground 14 years ago. Previously, commercial fertilizer had been used. Earthworms were very scarce. Only a small patch was used for a garden, the rest I had plowed and sown in alfalfa for goat pasture. We kept about 20 head of goats the year round, and the manure was scattered over the ground daily. Each spring I also limed the ground. Have noticed since reading *Organic Gardening* that the ground has a darker color and also absorbs or digests all organic material in a few weeks time after application. Earthworms are now very plentiful. The alfalfa has since died out, but have a wonderful stand of bluegrass. Was able to turn stock out on it about 1 month earlier than on pastures that had never been organically treated. The grass also has a different color than untreated pastures. I also notice that stock prefer eating where it has been recently treated.

Four years ago this spring set out 2 peach trees. They bore some fruit 2 years ago. Each winter I apply fresh chicken droppings around each tree. Last spring nasturtium seed was planted around 1 tree but not around the other. Both trees were in bloom when a freeze came but they withstood that in fine shape. Both trees had about the same amount of fruit but at the time of ripening the tree that didn't have nasturtiums planted around the base had fruit that was stung by some insect and the peaches got a brownish powder on them and rotted up on the tree in 24 to 36 hours. Managed to save some of the peaches by spraying with lime and rotenone. The tree that had nasturtiums at its base did not lose a peach. The two trees were only 50 feet apart. This year all our trees are going to have nasturtiums planted at the base.

As to the elm disease, we have six elms that have had both goat and chicken manure applied each winter from trunk to drip line, and they are thriving, while practically all the other elms in this vicinity are dead.

Am now composting all the manure.

Sylvester Klefeker,
Dayton, Ohio

●

I have recently purchased a small 17 acre farm and expect to farm, what I do farm, by the compost method.

I have experimented for the last two years with a victory garden and seeds started in composted soil have always done better and their fruit has always tasted better than vegetables grown with commercial fertilizer.

Last year when everyone around me was losing tomatoes by the bushel due to the wet weather, my tomatoes did not get the rot and though a little late, gave me a very abundant yield. Lima beans and string beans withstood the wet weather and I lost not more than 10% of seed planted, where neighbors lost as high as 90%.

Yours for composting,

H. B. Rebmann,
Philadelphia, Pa.

●

"We have been readers of your so good *Organic Gardening* for several months. *Pay Dirt* we enjoyed tremendously, and *An Agricultural Testament,* which we have just received, clinches it. Some worms which we ordered from Dr. Barrett are also working for us.

We have completed three Indore Process compost heaps made very like you suggested, and the results are

gratifying. In fact, some experimental carrots and turnips turned out wonderfully well."

B. M. Cole, Marietta, Ga.

●

I raised enough fine vegetables on a garden spot 30 x 50 feet to feed a family of five and had some to spare to give to the neighbors. This soil has had nothing but organic material on it for the past fifteen years and the bugs did not bother it enough to use a single drop of poison spray or insecticides on it this season.

Dr. L. L. Dolson,
212 Guaranty Bldg.,
Cedar Rapids, Iowa

●

Our Strawberries are attracting much attention—raised the "Organic Gardening" way.

Miss O. Wilson,
Hendersonville, N. C.

●

After gardening for five seasons without satisfactory results, I was ready to call it "quits".

One season of "composting" brought results that renewed my interest and enthusiasm. I now have approximately ten tons of compost seasoning for next year.

H. A. Goyke,
Arlington Heights, Ill.

●

"More than forty years ago my father-in-law used to raise many sunflowers in fence corners and other waste spaces. Neighbors repeatedly inquired the reason for so many sunflowers, but were never enlightened. When he was called "sunflower crank" and other nicknames, my father-in-law merely smiled and passed it off as a joke, and said nothing. However, his neighbors always wondered why the stock offered for sale was always sleek, smooth-coated, and fat, for which he always received top prices, whether cattle, horses or hogs. This is the secret: shortly before offering any stock for sale, they were fed sunflower seeds. And that was the secret the neighbors never learned."

B. H. Reddy, Redlands, Cal.

●

The compost made in accordance with the information furnished in your valuable pamphlet appears to be the answer to fertility in my clay back yard, where the soil when dry was almost white, and hard as a brick. After several applications of compost, it has become black and soft, and my second sowing of beans, put in July 29, stands 22" high and the plants are covered with blossoms. They are considerably more resistant to the bean beetles with which my other weaker bushes are infested.

I made a small box for my compost heap, only 30" x 42" x 21" high, with a slat bottom, supported on bricks about 3" off the ground. I had to make the sides solid as the compost material sifted through the open spaces in the sides. I used mostly pulled weeds with earth still on the roots, grass cuttings and manure which was mostly fine powder, from an old barn.

The compost heated nicely, I only turned it once, and it was wonderful stuff when it was finished.

In my second heap, in place of lime, I am using ground oyster shells which I can secure at a local mill, for $.50 per cwt. Or do you advise to use lime in addition to the ground shells? I can also secure ground lime stone. I believe the shells should be superior, being of organic origin.

I plan to keep my second heap until spring planting, under canvas, to avoid leaching from winter rains which would occur when placed in the ground now.

Your fine magazine contributes considerably to the understanding of the principles of plant growth, and I am happy to have made the acquaintance with your publications. Please extend my subscription another year.

C. O. Haase, Baltimore, Md.

EDITORS NOTE: Oyster shell flour may safely be used in place of ground limestone.

Snowball — Ferry-Morse Seed Co.

One Member of the Mustard Family.

The Mustard Family

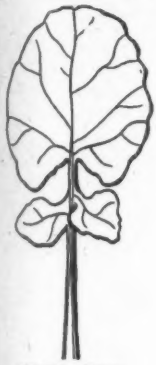
By RICHARD HEADSTROM

FEW of us realize, as we sit down with lusty appetite to a steaming dinner of corned beef and cabbage, that thousands of miles away we may find still growing wild on the sea cliffs of Europe the ancestor of our cultivated Cabbage; indeed, the ancestor also of Brussels Sprouts, the delicate Cauliflower, Broccoli and the other varieties of greens which the gardener raises with so much care.

It is not often that we find a primitive plant growing side by side, as it were, with our cultivated forms, for, as a rule, our domestic plants vary so much in form from their wild forbears that it is difficult to recognize the original stock, which, not infrequently, has already disappeared. But the Wild Cabbage is an exception, and yet if one should look at this plant, with its white or yellow flowers and few scattered leaves of green or reddish-purple, growing in its bleak and barren environment one might hardly believe that culture could have brought about such changes.

The Cabbage has no great value as food yet it has a place on our table, either cooked or shredded in the form of cole slaw. Incidentally, next time you have cabbage taste the core and you will discover that it has a somewhat pungent flavor which might remind you of the mustard you spread on your "hot dogs". The Radish, which was grown at the time of Christ, also has a sharp flavor and so, too,

have many other plants, as the Water Cress, highly prized for its pungent-tasting young leaves. Is it possible that such different appearing plants as the Cabbage, the Radish, the Water Cress and the Black Mustard, whose



Winter Cress

Yellow Cress

brown seeds are ground up and used as a condiment, have anything in common beside the pungent flavor when eaten?

All these plants, surprisingly, are related to one another for they all belong to the same group of plants called the Mustard Family. But not, as you might suppose, because they possess a pungent juice for there are other plants with similar taste properties which are wholly unrelated to the members of the mustard group. By the same token the Beet, Carrot, Turnip and Sweet Potato are all known as root crops but except for the fact that they are all grown for the food which they store in their roots have nothing in common; they belong to four separate plant families, the Turnip alone belongs to the Mustard Family.

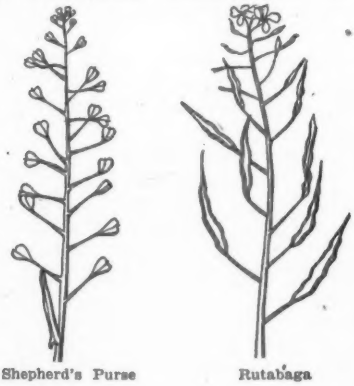
To anyone not familiar with botanical classification the placing of such seemingly divergent plants as the Cabbage, Cauliflower, Turnip, Radish and Mustard in the same group would appear an arbitrary and confusing procedure. But these plants have been grouped together in the same family because they all possess the same flower structure and the same type of fruit pod. Examine, if you will, the pale purple flowers of the Radish and compare them with the small pure yellow flowers of the Black Mustard, blooming in fields from June to September, and you will find that they are alike in having four sepals and four petals which are arranged in the form of a cross. Later on, when the flowers have gone to seed examine the fruit and you will find that they too are much alike, forming a pod whose sides split off from the central plate, leaving the seeds free to fall, the seed pod being technically called a silique.

The scientific name of the Mustard Family is Cruciferae, from the word crucifer meaning cross bearer, in allusion to the cross arrangement of the petals and sepals. The Crucifers are, by no means, martyrs despite their name, but a group of vigorous plants adapted to more than hold their own in the struggle for existence. Examine any one of them and you will note that they make one stem serve for many flowers and that they do not permit a flower to develop at the tip of the stem for to do so would put a stop to the upward growth of the stem.

Indeed, why wait until such time as you happen to think of it? Why not go outdoors at this moment and look around on the roadside or near your dwelling for the Shepherd's Purse, a wild crucifer which is so common as to be considered a weed. It is a slender little plant with small white flowers in a long loose raceme, followed by triangular and notched seed pods. Bear in mind what I have just said and you will observe that one stem does service for all the flowers and that not one of these flowers is to be found at the tip of the stem. You will also observe that the flowers though small are not entirely inconspicuous. This is because they are clustered together so that collectively they might attract those insects which aid in pollination, something which they might not succeed in doing were they arranged separately by themselves on the stem. Here

we have one reason why the plant has been able to march around the world and compete successfully with other plants that might question its right to exist. Notice, too, as Summer passes into Autumn, that the plant continues to blossom until frost covers the ground. By thus extending its flowering season far beyond that of any native flower it avoids the fierce competition for insect trade that it would otherwise meet with were it to flower during a shorter period. And in your daily journeyings note the places where you find it growing and you will discover that it is not a proud plant but will take root wherever it may; it is not choosy but is easily satisfied with unoccupied waste land and other locations which other plants refuse to grow in. Is it any wonder, then, that the plant has been eminently successful in its struggle for survival?

Most children are familar with the Shepherd's Purse because of its peculiar triangular pods which are supposed to resemble a shepherd's purse. They are equally familiar with the



Shepherd's Purse Rutabaga

Peppergrass, another wild crucifer that we find along roadsides and in waste places, growing literally side by side with the Shepherd's Purse. When I was a boy I used to place the seed pods, which cluster thickly about the flowering stem in a cylindrical curving column, between my teeth and break them for their peppery flavor. As a matter of fact I still often do when I wander through the fields and woods.

As a rule our early spring wildflowers are small, shy and seemingly delicate little plants and we find them more by accident or by pains taking search. There are exceptions of course, such as the Yellow Rocket which sends upward from a single root crown a dozen or more sturdy stems a foot high, each bearing a showy panicled spike of brilliant yellow flowers. This is the plant we find brightening meadows and the banks of neglected runlets in early April when it gives color to a landscape not yet painted by Nature's paintbrush.

The Mustard Family includes almost two thousand species of herbaceous plants distributed through Europe, Asia and North America. Some are grown as food plants, a few are planted in our gardens but most of them grow wild. Among the Anemones, Bloodroot, Claytonia and many other delicate spring blossoms, we may find, if we search diligently, the Toothwort, a low woodland plant having two opposite leaves on the stem and later on during the Summer we may find along roadsides and waste places the Black Mustard with its small pale yellow flowers or the Field Mustard with similar flowers or even the Hedge Mustard, which doesn't seem to mind growing in rubbish heaps. The Cresses, of which there are many species, are also wild crucifers. Some like dry situations, such as rocky banks and stony pastures, but others prefer wet places.

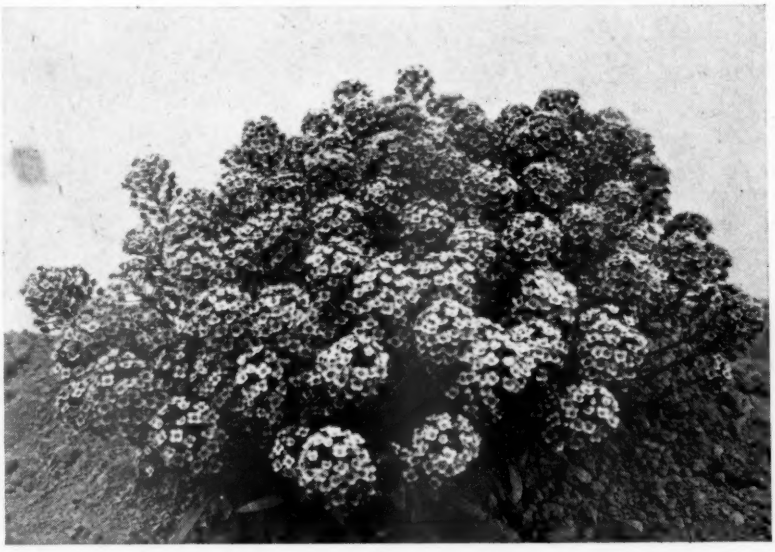
Watercress, which is highly prized for its pungent-tasting leaves, delights in brooks and small streams. The leaves and tender shoots have been used for greens and salads since ancient times and are also much used as a garnish. It is said that Xenophon recommended the plant to the Persians and the Romans considered it an excellent food for people mentally ill. It is cultivated in many parts of Europe and in the United States great quantities are produced for the market where it is sold in such closely

packed bunches that we hardly recognize them as the plants we find floating on the water. In a few instances, a cultivated crucifer has escaped from our gardens and taken to growing wild. The Radish is one that I have in mind and quite frequently we find it growing about old fields. The Horseradish is another which may be found growing in waste places, especially along brooks although it is still extensively cultivated for its white fleshy root, which is grated, mixed with vinegar and used as a condiment.

Two garden flowers of the Mustard Family, Honesty and Dame's Violet, are sometimes found as escapes from cultivation. The first has long been cultivated for its flat pods which are used in winter bouquets of dried plants. The plant is erect, bushy and rather coarse and the pink-purple flowers ordinary but it is redeemed by its curious flat seed-vessels which have been called the "Pope's Money" but why, I do not know. Dame's Violet has also been long under cultivation. According to early English gardeners ladies were fond of having it in their apartments because of its fragrance, hence its name. It is also known as *Hesperis*.

Many of our garden flowers were first planted in England whence they came to our shores. Gerard, an early English botanist, tells us that in 1587 he received some seeds that produced in his garden flowers that were "sometimes blue, often purple, sometimes flesh-colored and seldom white." This plant appears to have been Purple Candytuft, now common in our gardens. A related species, the Evergreen Candytuft, is frequently planted with Moss Pink as a border for a flower bed, the two making a beautiful border or even a flower bed of early spring flowers. Sweet Alyssum, a densely flowering plant, is also a favorite for borders. It is one of the last annuals to surrender to winter and will continue to flower into late Fall, its white sprays usually being found at Thanksgiving and even much later.

EDITOR'S NOTE: The weeds among the Mustard family are given a separate treatment in Dr. Pfeiffer's new book "Weeds and What They Tell", No. 11 in the *Gardener's Book Club*.



Sweet Alyssum VIOLET QUEEN — **W. Atlee Burpee**
Another Member of the Mustard Family.

Cosmos *Sensation* W. Atlee Burpee

The Cosmos is a member of the Composite Family like the Zinnia.

by H. K. MEYER

Over the Fence

SOME PARTS OF BOTANY are sadly unknown. You would think that there should be a book which tells us how long different flowers stay in bloom, whether they close at night or stay open, whether they produce one flower or many, etc. Such information would allow us to draw conclusions as to the background of the various species. There are not even reliable data for flowering dates in most regions. This spring, I started a record. The first flower was a yellow crocus, next came a row of Kaufmanniana tulips, so-called specimen tulips and quite lovely in their chaste pure beauty, then came some large daffodils, surprisingly amethystine mertensias, and the blue crocuses. The tulips, originating in Turkestan, where General von Kaufmann discovered them, opened in the middle of the morning and closed every evening for almost two weeks. One flower to a plant, but ample opportunity to become pollinated.

—o—

SOME PLANTS have a special ability to collect rare minerals from the soil. The common horse-tail (*Equisetum*) is reported to be a gatherer of gold, while the poisonous toadstool *Amanita muscaria* collects vanadium in greater amounts than other plants. This latter reference is cribbed from the *Marginalia,* which the most comprehensive scientific mind of our age known to me, Professor G. Evelyn Hutchinson of Yale, regularly writes in *American Scientist.*

HERBERT LUNT of the Connecticut Experiment Station recently wrote on the value of wood ashes as fertilizer in *Chemurgic Papers,* 1946. In terms of potash, phosphorus, and lime alone, a ton of wood ashes may range from $3.50 to $10.—It is interesting to see how different woods have different contents. 48 per cent of the ash of oak was lime, while the pines went as high as 68 per cent, the ash trees as low as 23 per cent. The potash content of the ash of ash trees was as high as 46 per cent, while Old Field Pines had a bare 3.8 per cent. Magnesia varied from half of one per cent in Black Pine to over 10 per cent in a hickory. Naturally, the soils had something to do with the ash analysis of the wood.

—o—

OUR READER, Myron Herrick, President of the large *American Mushroom Company,* sent us a valuable analysis of mushroom manure after the mushrooms were grown: There still were over 2 per cent of nitrogen. 16.5 per cent was lignin, which we now know stimulates early plant growth, as the experiments of Stuart Dunn, Seiberlich and Eppelsheimer at the New Hampshire Experiment Station showed.

—o—

ANOTHER READER, Mr. S. T. Hughes, wrote me: "There are many times the poets in rural Wales than in Ireland and Iceland put together." As the name shows, Mr. Hughes is a Welshman and I am not going to dis-

pute his claim. But I am going to put in a word for the national plant of Wales, the leek. I wintered some in the open, besides having the cellar well supplied with dug-in leeks, and I hope that more gardeners follow my suggestion and experiment with leek, one of the most delicate of vegetables, especially for lovers of uncooked food.

—o—

THIS SPRING, I sowed seeds of about thirty different varieties or species of lilies, hybrid amaryllis, hemerocallis, and other tuberous and bulbous plants. The germination was universally good, though not always perfect. The amaryllis and hemerocallis seeds seemed to perform best. Amaryllis seeds must, of course, be set on edge, to get better action. It will take some time until the lilies will be of blooming age, but considering the fun I had in growing these easily-grown plants to the present stage I don't mind waiting for a couple of years and see their further progress. There is considerable suspense in this game: will I get an unusual seedling with unusual coloring? After all, it is always possible, as could be seen at the New York Flower Show, where an all-white amaryllis was displayed.

—o—

THE LONGER I GARDEN, the more I see why specialization is the only way out for the amateur gardener who does not have professional assistance. You simply cannot do justice to begonias and fuchsias, amaryllis and phyllocactus, geranium and iris at the same time and throw in a few experiments with dahlias, peonies, and cinerarias. There is not enough time to do it. There is, however, enough time to have begonias and amaryllis and phyllocactus and a few geraniums and fuchsias, if you take care of them during the winter. And if your garden is laid out spaciously enough, you can have all the irises, peonies, lilies, and other tubers and bulbs you want, provided you take care that the number of hardy plants is great enough not to cause any rush of work at any one period. I never cared for tender chrysanthemums, and I have a fine display of hardy ones every fall. No bother at all, except throwing a few spades full of compost and a few bushels of leaves over the plants off and on. Now is the time to plan for your perennial garden, if you have not already done so. And I'd call attention to the beautiful aconitum, which, though slow to germinate, is worth having, even if you cannot get more than a few plants out of one seed packet.

—o—

Market Grower's Journal discussed the use of DDT for commercial growing. Tomatoes showed definitely undesirable results after several dustings and sprayings. "After the second or third application, plants that received the heavier dosages exhibited symptoms of abnormality, such as the curling or rolling of leaves. . . . It was evident from the data obtained that the DDT treatments had reduced the set of fruit, and the extent to which this reduction occurred corresponded in a general way to the amount of DDT applied." They found that the severest injury came from repeated applications, but the matter is, of course, much more serious, as previously pointed out in this column: DDT is accumulated in living tissues. Rats died when they were fed milk that came from barns sprayed with DDT.

DDT was not effective against many pests, including aphids, red spider. "This, no doubt, occurs because DDT destroys the predators, or natural enemies that feed on the mites." Thus, the chemist can upset the balances and checks offered by nature; thus, he can deposit minute amounts of cumulative poisons that may find their way into animal and human bodies and wreak havoc with health and well-being.—Hands off! Mankind has got along without "the most effective insecticide" so long that it need not wipe itself out to please DDT fans.

Kohlrabi Early White Vienna — W. A. Burpee

Hints For the Vegetable Gardener

By ROGER W. SMITH

KOHLRABI

Of all the cultivated descendants of the wild cabbage, the kohlrabi is perhaps the most peculiar. You have noted how, in the heading type of cabbage, the leaves of the plant (usually loose and spreading) were caused to form a tight head. In the cauliflower, accent was placed on the formation of huge flower buds. With the kohlrabi all breeding and selection has been aimed at the production of an immensely swollen, edible stem.

Probably long before recorded history began this vegetable was essentially much like it is today. Some slight polishing up has been managed during the last hundred years, new names have been suggested, but most of the heavy work of developing this thickness of stem was doubtless performed by nations and their gardeners of which we have no knowledge.

Today, many people like cabbage with corned beef. As you have noticed, some like cabbage this way and some like it in another form. Many who enjoy it prefer the thick leaf stalks and the boiled stems. They find in these more flavor and much more substance. You will likely remember some who even have a liking for the thick leaf stems of the broccoli—which are exceptionally "strong".

This matter of taste has always been the guiding hand that directed the form which our cultivated plants should take. Because many people liked to eat cabbage stalks rather than the leaves the kohlrabi came into existence.

At one time there was some misunderstanding regarding the origin of this plant. It was suggested that it was a cross between a cabbage and a turnip. This was a handy and very easy explanation of the strange appearance of the swollen stem. It has no basis in fact.

If you want to prove this you have only to observe the manner in which the leaves branch from the swollen stem. Ancient man worked with Nature as he understood it. He followed the natural tendencies of the plant. Most members of the cabbage family are biennials, that is, they store up much nourishment for their use during their second year of growth. They can't manage to do the whole job of growing and reproducing themselves in one season so they gather themselves together to finish the job the following year.

But ancient man, at least some ancient men, especially those who liked to eat cabbage stems rather than cabbage leaves, encouraged the kohlrabi plant to store up overwinter its reserve of food in its thick stem.

Kohlrabi was known in the Mediterranean area since history began. It was probably brought to western Europe by way of Prague and Vienna.

You will find kohlrabi very easy to grow. Quick growth is essential for the best results. Kohlrabi demands about the same conditions as those required for cabbage, a well-limed soil rich in organic matter and moisture. The addition of fair amounts of compost humus to increase available plant nutrients and to increase the moisture-holding capacity of the soil are essential for rapid, natural growth of the plant. Your kohlrabi will do well if you treat it as a cool weather crop, much like early cabbage.

As with early cabbage, kohlrabi seed may be started indoors in a box placed in a sunny window, or the seed may be sown in drills in the open garden. The plants should be set out about six inches apart in the rows or the seedlings thinned to this distance. The rows should be about fifteen inches apart. Seed sown in the open garden should be covered with about one half inch of finely sifted compost humus and well firmed. The idea is to get the plants off to an early start.

Since kohlrabi is a cool weather plant and will stand some frost, a Fall crop may be grown. In this case, you will find it convenient to sow seed in the open garden about the time you sow late cabbage, or about sixty days before severe freezing begins in your locality.

The swollen stem of the kohlrabi is often disk-shaped sometimes almost sperical. How can you tell whether this round object is really a swollen stem? The matter is easily settled. From what is known commonly as the "bulb" of the kohlrabi the leaves spread out. The long stalks of the smooth and cabbage-like leaves emerge in the same order that they would grow if the stem of the plant had not been enlarged. You may have discovered that with some plants the bases of the leaf stalks have been much widened but that their position remains unchanged.

Two excellent types of kohlrabi are available for your garden. Early White Vienna (55 days to maturity) has green leaves, smooth green skin and creamy white flesh. Early Purple Vienna (60 days to maturity) has purplish leaves and purplish skin but its flesh is an attractive greenish white, tender and crisp.

When the swollen stems have reached a diameter of about two and a half inches they should be harvested. To do this you just have to pull the plant up by the roots, not a difficult chore. At first you might pull up only a few, and wonder what to do about them. Try to eat them raw after you have peeled them—you will find them most delicious.

You clip off, or break off, the leaves and the roots, rolling the spherical root-stem around in your hands as you do it. Just a swollen cabbage stem. Boiled cabbage stems make fine eating. You've got something solid under your teeth. When you eat well-

prepared kohlrabi of your own growing you will find it "dainty eating" and very much worth while.

Of course, vegetables grown by the organic methods which you follow grow better. Their health is better. They taste better because they contain more health-giving substances than unhealthy plants, artificially produced.

Kohlrabi is very rich in Vitamin C, a fact which may easily justify its fabulous record as a remedy for high blood pressure. Whatever its medicinal value, you will agree that the harvesting of the fat stems is a pleasant task and that the eating of them is something to be remembered.

Organically grown, kohlrabi is practically free from plant disease or serious insect infestation. Cabbage pests sometimes attack the leaves of slow-growing, improperly nourished plants but even then they seldom do much damage to the stem.

When you grow this plant you might like to wonder where it came from and how it came to America. It is a very ancient vegetable. It differs in form from wild cabbage in a striking degree. A tremendous amount of breeding and selecting must have obviously caused the development of the swollen stem. Yet this plant was already in much its present form during the days of earliest Egyptian records.

No one really knows how the kohlrabi crossed the Mediterranean in those long forgotten days. How it made the journey across Europe is also a matter or conjecture. Apparently the plant made a long stay in the neighborhood of Vienna—or perhaps, the old Viennese liked it well and improved it more than others—before it travelled farther West. It finally reached north-western Europe and thence it voyaged to America.

You will more than likely think of these things and many others as you spin the fine vegetable in your hands. A little heap of them lies at your feet. You gather these up and hurry to the house eager to know whether, when they are washed, peeled and cooked, they will taste as good as you believe they will.

Early Purple Vienna — Burpee

Gardening Device

PLANT STAKES

THERE ARE TWO KINDS of plant supports available for either potted plants or the border. Sometimes, they are indispensable, as numerous flowers make a dangling growth, ambling over the ground, unless held upright. Other plants would have a natural support in the wild by holding onto the uneven levels of the ground. In the garden, the bed may be on one level and the plants must be given artificial support. Naturally, you can tie them to a stake or bamboo rod, but you may be well served by one of the devices sold by seed houses. The first type is stationary, the second is movable and goes upward with the growing plant. It depends on the luxuriousness of plant growth whether you want to choose the one or the other, but both serve a purpose, just as the back of the chair helps us when we get in tired from bending down to our flowers.

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Organics on Blackland Soil

THE BLACKLAND SOILS of Texas are known not to respond to mineral fertilizers and synthetic fertilizers, because these rich clay soils are already rich in most minerals. Phosphorus becomes fixed as soon as it is applied unless it be in rock form. The nitrogen fertilizers do not show great response either. What does? Professor L. G. Jones of College Station, Texas, writes: "The best results have been obtained from barnyard manure or from winter or summer legumes plowed under. Any green manure crop such as oats gets marked results." Under garden conditions, manure and green matter can be composted; in the field, they can be applied by sheet composting methods. But they must be applied, because the soil wants organics.

●

FORGET-ME-NOTS are not always blue in color. Some are white and some pink, some even bronze. Their scientific name, MYOSOTIS, refers to the shape of the leaves and means Mouse-ear. In some parts, this innocent flower is known as Scorpion-Grass.

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A Neglected Study

By E. F. WATSON

Calcutta, India

SHOULD there not be a compulsory course in all our agricultural colleges on making soil *de novo* from subsoil? I am sure both students and professors would learn a lot from it.

It would only be necessary to strip off the nine inches or so of surface soil from an area and let them try out their manurial recommendations on it unhampered by what may have been done by previous generations of cultivators.

It sounds drastic, but not impossible.

When Government House, Darjeeling, collapsed in the earthquake of 1934, it was found necessary to remove the whole fissured hill top to a depth of 8 feet before a sound site for the new building could be obtained. All this material, consisting of more or less disintegrated rock, had to be deposited on any adjacent areas that would retain it, the filling reaching to a depth of 16 feet in places.

I was faced with the task of making a garden of this stuff whose barren nature was shown by the scars of landslides on the adjacent mountains which took three to four years before sufficient weed growth was established to hide them.

After terracing and contouring all slopes I had several acres of bare subsoil and rock rubble to deal with and could only collect enough surface soil from the neighborhood to provide a dressing one inch thick over the whole.

I had, however, been busy making Indore compost and had enough to give a quarter of an inch of this with an extra couple of inches on parts designed as flower beds and borders.

I sowed the area with grass seed and within six months had an excellent lawn and within eighteen months beds and borders that left nothing to be desired.

The compost dressings, made from the area's own wastes with added leaf falls and stable litter, have been continued annually since and no artificials have ever been used. The garden has never looked back even when rainfall was deficient.

A point that has astonished me has been the rapidity with which humus dressings have caused the disintegration of the rock particles with which the area was originally covered; now after a lapse of ten years it is difficult to find a piece anywhere.

The Banker

"IN A WELL MANAGED GARDEN the compost pile is the bank of fertility. The gardener makes deposits and withdrawals. It is wise to keep a substantial checking balance by saving and depositing practically all wastes that will decay. *Banking is better than burning.*"

U. S. Department of Agriculture, Office of Information

The Case of the Strawberry

By EHRENFRIED E. PFEIFFER

OF strawberries there are many different kinds, from the small wild ones with a slightly sour-sweet taste but very aromatic flavor, to large ones with an inch and a half diameter but practically no flavor and the taste a little soapy. In general the flavor decreases with increased size. Wild strawberries grow best on rather poor, acid soil; they prefer light, sandy soil with sufficient moisture, and dislike heavy clay. They grow along the borderline of woods and shrubs into the meadows. Domesticated strawberries grow best on a loose sandy to medium light soil which warms up easily and is heavily manured or fertilized. Hence the increase in the size of the fruit. Increase in size, however, without being balanced by "something" usually means decrease in flavor. Wild strawberries contain a lot of biologically active substances, including a remedy against heart diseases. But these are no longer present in the domesticated kinds.

What is this "something" that makes the wild strawberry excel? Can we do something to have our garden plants yield a heavy crop and the berries still have a rich flavor?

Wild strawberries like a certain amount of shelter, not that of dense woods, but the lighter shade along the edge of the woods, near shrubs, even near biennial plants. If we study this habit more closely we find that it is not so much the shade but the falling leaves that cover the soil which influence the little plant.

The plants have a lot of fine, short roots. The runners too are very sensitive when they begin to grow. The strawberry wants a protected, permanently slightly moist soil. If this protection consists of leaves which gradually form a humus cover when rotted, then our plant is most happy.

Now comes man and transplants it to his garden. Big berries he wants and a lot of them. A deep cultivated garden bed is prepared and a lot of fresh manure put on and the little plant cannot help but develop big fruit. But it misses the good "home" atmosphere and forgets about all the refinements. Man gets only what he wants—size. The strawberry is indeed a tender maiden, tough if attended to properly, according to her desires, but weak if estranged from her natural habitat. In God's free nature the strawberry grows in between other wild plants—weeds. But these are the worst things to have in a garden bed. The berry plant does not take up competition with them. It needs moisture but does not search for it with far and deep going roots. It searches, however, for protection, for cover. It grows best where leaves from trees and shrubs fall and cover it. A little shy she is—but if we give her that protection she will blossom forth alright and bear fine fruit.

The commercial growers whose methods are so cruel that they have only one crop from the plants, for weeding is too expensive, have made one good discovery—that the best growth is obtained when the seed bed is well prepared in advance by means of plowing under one, two, or three green manuring crops the previous year and a lot of manure and discing and harrowing afterwards. Then they harvest big, 3000 to 8000 quarts per acre. A lot of organic matter in the ground is what does the trick here. The home gardener, or whoever grows for himself or on a moderate scale,

particularly when the customer cares for quality and fine flavor, will soon discover that strawberries "ain't any more what they used to be", in spite of the green manuring. City people who are used to the luncheon counter type of eating—just like: "Fill her up" at a filling station—don't know the fine differences in flavor and quality. They eat calories, protein, carbohydrates, vitamins, etc., to get their fill.

One day a friend of mine had a strawberry patch near a hedgerow of spruce and fir. The needles dropped on the patch. The fruit on this place had the finest flavor you can imagine and was still of a respectable size. Now we had the solution. In the following we are going to tell how you can have big berries and at the same time good ones.

A slightly sheltered location is best, protected against drying winds. Light to medium soil does better than heavy cold clay. It pays to get a load of sand and mix it with the clay surface. Loosen the soil on the surface but do not work too deep. A fine seed bed is wanted, well manured. But since the plant likes leaf humus, it is preferable to have a well rotted manure compost. Otherwise the berry will be juicy but tasteless. (This the strawberry has in common with the cabbage: it grows big on fresh manure, but—oh, the flatulency—the berry is hollow inside). Now comes the second mistake. The transplants are shipped and the root ball and the fine hair roots dry up. The plant whose roots are very tender has to form new ones which take away a lot of life energy.

Take care that the roots never dry up. With your own transplants you are much better off. Leave the root balls in basket or wheelbarrow with (sandy) humus compost underneath the roots as well as covering them. If you have heavy, cold, moist soils, by all means use raised beds. In general for the home garden we recommend raised beds, three to four feet wide for this purpose. This writer has used them even in a commercial scheme. Plant two rows on a three to four foot width, the plants eight to ten inches apart in a row. The bed has to be absolutely free from weeds, it must be cultivated in advance. Take your transplant from a young, strong, one year old mother plant. Allow not more then six runners on the mother plant.

Raise the seed plant in very good, well rotted compost earth mixed with sand and, if you can, with wood soil (from the surface).

Wire worms in a recently planted strawberry patch are quite a pest. Plant lettuce in between the berries. The wire worms and maggots go to the lettuce. Check every morning, underneath the wilted lettuce you will find the beast. In the first year strawberries can be intercropped with bush beans, particularly when spring planting as cover and nurse crop. If transplanted in August or September, which we prefer, mulch after planting with a mixture of very ripe manure and leaf mould left as a winter mulch. This mulch should be loose enough to allow air and light to get to the plants, which rot easily when covered. Should the winter mulch disappear add a new light mulch. A half ripe compost, containing pine, spruce, fir or hemlock needles is best and produces the finest aroma in the fruit. If you have no conifers nearby it pays to collect the needles wherever you can get them and mix them with your compost. In the long run you will have a few conifers planted in or near your garden. By using this compost you will also have the advantage that the fruit bearing stems stand more upright. You will not need paper or wood shaving to protect the berries against lying in the mud. Mulching also makes weeding easier.

Right after the plants have stopped bearing remove the strongest runners for propagation. You can set out a new bed every year, thus having three to five strawberry beds at a time. For it has been our experience with the compost-mulching method that straw-

berries will last and yield satisfactorily for at least three and in many cases for five years. It is important, however, to give a compost mulch right after harvest. At this time weeds have to be removed and the plants form the buds for the coming year. Then they need the strongest support. A second manure-compost-mulch may be given in November. After removing the runners and cleaning the bed the soil may be hoed before mulching, or the mulch can be worked slightly into the loose soil. When mulching, do not cover the plants. Late in summer remove all new runners as well as the old discolored and spotted leaves and loosen the soil up again before placing the winter mulch. Do not put strawberry plants or leaves into a compost destined for strawberries.

This writer has seen quite good results with diatomaceous earth spread over strawberries in small quantities. The use of diatomaceous earth, as a stimulant for upright growth and length, is almost unknown as yet, but in the case of the strawberries as well as with other garden crops it has produced surprising results.

EDITOR'S NOTE: Diatomaceous earth is the deposit that accumulates at the bottom of oceans and fresh water expanses from the mineral skeleton of diatoms, beautifully organized microscopic plants. These skeletons contain mainly silica, the most frequent mineral on earth that is present in granite, sandstones, etc. It is mined in several parts of the country, especially around Chesapeake Bay, and is very abundant in Southern California, where the great oil fields drain from the diatomaceous shales.

The Safe Way

"INCIDENTALLY, there is a reference in Waksman's "Humus" to some papers on the vitamin content of wheat and millet from manured and unmanured soils and it is stated that wheat grown on manured soils was rich in vitamins. I think it is logical to extrapolate and to conclude there is a very high probability for the existence of growth factors which may be more essential even than vitamins that have not been isolated and may never be isolated, because they probably occur in small concentrations. The only way to be sure is to eat vegetables grown on the right kind of soil and meat from animals raised on plants derived from the right kind of soil."

Dr. L. W. Blau, Houston, Texas

Chemical Fertilizers on Trees

SPRUCE PLANTED ON LAND treated with various combinations of artificial fertilizers in dry and liquid form did not make any better growth. When dry fertilizer was applied in the field, fewer trees succeeded when the fertilizers were put in the planting hole. White spruce did a little better than Norway spruce, but not consistently so. These are some of the findings of Herbert A. Lunt of the Connecticut Station at New Haven, presented before the meeting of the *Soil Science Society* at Columbus, Ohio, in February 1946.

EARTHWORM WITH CLITELLUM Courtesy Frontiers

Earthworm Observations In 1777

GILBERT WHITE published in 1789 *The Natural History of Selborne,* in which a letter appeared, dated May 20, 1777, and addressed to the Honorable Daines Barrington. Our subscriber, Mr. H. F. Grout of Needham, Mass. made an excerpt for the benefit of other readers. We are glad to bring this unusual bit of information before them since many think that earthworms were more or less neglected before the studies of Darwin called attention to their earth-working capacities.

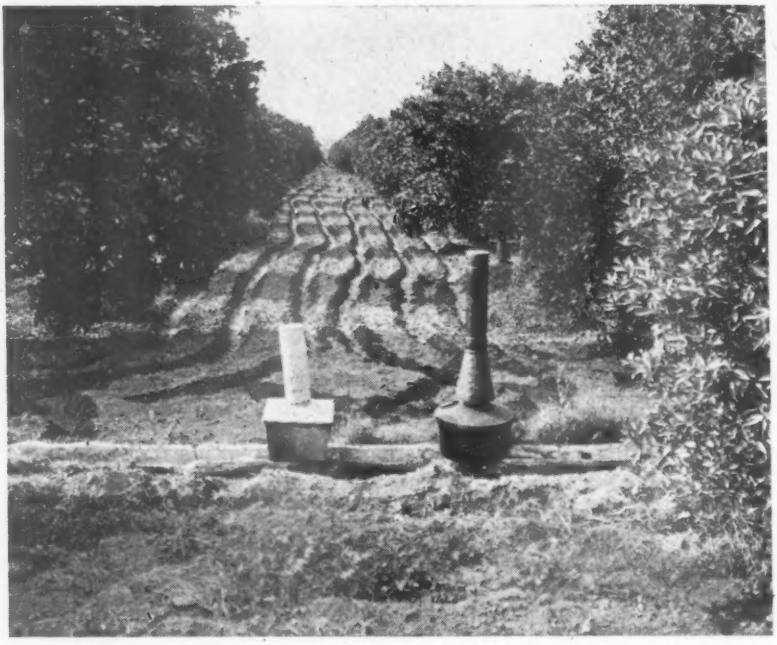
Dear Sir:

"Lands that are subject to frequent inundations are always poor; and probably the reason may be because the worms are drowned. The most insignificient insects and reptiles are of much more consequence, and have much more influence in the economy of nature, than the incurious are aware of; and are mighty in their effect, from their minuteness, which renders them less an object of attention; and from their numbers and fecundity. Earth-worms, though in appearance a small and despicable link in the chain of nature, yet, if lost, would make a lamentable chasm. For, to say nothing of half the birds, and some quadrupeds which are almost entirely supported by them, worms seem to be the great promoters of vegetation, which would proceed but lamely without them, by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves and twigs into it; and, most of all, by throwing up such infinite numbers of lumps of earth called worm-casts, which, being their excrement, is a fine manure for grain and grass. Worms probably provide new soil for hills and slopes where the rain washes the earth away; and they affect slopes, probably to avoid being flooded. Gardeners and farmers express their detestation of worms; the former because they render their walks unsightly, and make

EGG CAPSULES — Courtesy Frontiers

The Clitellum is the swollen part which secretes the egg capsules in which the young worms develop.

them much work; and the latter because, as they think, worms eat their green corn. But these men would find that the earth without worms would soon become cold, hard-bound, and void of fermentation; and consequently sterile: and besides, in favour of worms, it should be hinted that green corn, plants and flowers, are not so much injured by them as by many species of coleoptera (scarabs), and tipulae (long-legs), in their larva, or grub-state; and by unnoticed myriads of small shell-less snails, called slugs, which silently and imperceptibly make amazing havoc in the field and garden. These hints we think proper to throw out in order to set the inquisitive and discerning to work. A good monography of worms would afford much entertainment and information at the same time, and would open a large and new field in natural history. Worms work most in the spring; but by no means lie torpid in the dead months; are out every mild night in the winter, as any person may be convinced that will take the pains to examine his grass-plots with a candle; are hermaphrodites, and much addicted to venery, and consequently very prolific."



Charcoal burners and irrigation ditches — Galloway

Weather

By LT. COMMANDER ALASTAIR I. MacKAY

Note: Commander MacKay, after half a lifetime on the sea, has just acquired a farm on Maple Bay on Vancouver Island, ready to practice organic methods.

THE seaman and the airman are weather-wise; they have to be, for their safety, sometimes their very life may depend on their knowledge of meteorology. The government boards who grant licenses to navigate ships of the sea and of the air insist that candidates for these responsible positions pass examinations in the science of weather.

The seaman and the airman are weather-wise; the landman is usually only weather conscious. Daily weather reports of press and radio generally invoke no greater response than whether or not to wear rubbers or fit tire chains. Even the gardener or orchardist too often neglects the most elementary facts of weather wisdom. Yet it is implicit that good seed and good soil are entirely dependent on a third factor, weather, for satisfactory gardening results. Otherwise careful horticulturists will study seed catalogs for weeks, go to great pains to amass compost and build up an excellent seedbed, but once the seed is in the ground and presents evidence of germination they will practically ignore its progress until harvest time approaches. In the most material sense, weight, a plant is preponderantly a product of

the atmosphere. Equally so does its welfare depend on sunshine and shower, seasonal warmth and air circulation. Why then are we so neglectful of this prime factor, weather?

Probably the absence from most school courses of a simple, interesting presentation of weather and climate knowledge is largely responsible. Some who have aspired to a little self-education in meteorology have been discouraged by the scientific language used in even elementary texts; weather maps and symbols can be as mystifying as Greek to the uninitiated. Technical and mathematical knowledge, and a battery of instruments, are uncalled for in relating atmospheric phenomena to the down-to-earth interests of the gardener, the fruit grower and the country dweller.

The bear and the squirrel, the wild goose and the seagull, trees and plants have their own short and long range weather forecasting system. Occasionally, in the country, you will find a nature student, sometimes lacking formal education, who has studied the weather ways of animals, birds and flowers, and confirmed some of the old folklore with his own careful observations. Scientists usually sneer at this type, but sometimes his batting average is better than theirs. Falling leaves are merely an outward sign of the trees' winterising process. Sap is withdrawn into the roots, to avoid frost bursting the cells. Young growths are hardened; winter buds are protected with a coating of resin or gum.

The twinges of rheumatism or sciatica, the sudden stiffness of limbs and joints associated by many sufferers with weather changes is now believed by certain investigators to be due to changes in atmospheric pressure affecting the water retention of the body tissues. People on a reducing diet do not associate barometer readings with the record of the weighing scales, and they are surprised and puzzled when a day or two of sparse fare apparently fails to remove any avoirdupois, while on other occasions a couple of pounds drop off overnight. A low barometer favors tissue water retention, while a high pressure atmospheric system expels moisture and reduces weight.

Gardeners too often assume that dry spells and untimely spring and fall frosts are the only types of weather to which their plants are sensitive, and which require corrective or preventitive measures. These threats are comparatively scarce in the life cycle of growth, and such an attitude obscures the importance of the day to day influence of changing weather on the health and life of the plant. Domesticated plants are just as sensitive as domesticated humans to weather fluctuations, and suffer illnesses and indispositions equally detrimental to stamina and well-being. They cannot don and doff sweaters and overshoes, shelter in warm homes or move to Florida for the winter. They have to stand up and take it.

Much has been written lately of the hardihood and vigorous growth of wild plants and weeds growing naturally in fencerows, ditches and roadsides. The showing made by man's expensive mechanical cultivation has been unfavorably compared to nature's methods. While some of this criticism is justified, as organic gardeners know, other considerations are involved such as the specialised and abnormal character of domestic plants compared to the original wild growth. Nature's fundamental interest is the survival of the species, so hardiness and limited but adequate seed-bearing are the emphasised traits. Man, by selective breeding, multiplies the seed and fruit bearing capacities far beyond nature's plans or needs, and develops an edible product attractive to the sight, the taste and the smell. Varieties capable of preserving their outward appear-

ance in the far distant markets, others forcibly adapted to unseasonable climes and epicurean tastes, have produced types of domesticated plants which in the eyes of nature are nothing but freaks and abnormalities. or at best sissies. At the same time nature's weather remains untamed, and except for a few favored seedlings coddled in greenhouse or hotbed, man's domesticated and enervated plants are thoughtlessly left to its mercies.

Plants respond to intelligent care and attention just as do humans. The remarkable success of organic gardeners is not solely due to their use of compost and humus. An equally valid reason is that a good organic gardener is friendly and understanding towards the soil and the growing plants. He observes, compares and studies his plants, getting to know them and to recognise their special needs. He doesn't regard fallen leaves and weeds as messy trash; associating with nature, he realises that each plant and each process has a purpose; that nature tears down but to build up anew. He cooperates with the weather, with sun and rain and air, just as the helmsman of a sailboat cooperates with the wind to speed its voyage. He knows that the dark composted soil attracts and retains heat from the sun's rays; that the loose, spongy, well-drained structure prevents surface runoff, retains moisture yet permits rapid drainage of excess water; that necessary aeration is facilitated. This is the natural way, the intelligent way, to weather-proof delicate plants. In exposed locations, windbreaks are indicated; storm damage will require more direct aid.

Snow is commonly considered as the death of all garden activity. Frost and snow are frequently regarded as the Rome-Berlin weather Axis, bitter enemies of democratic horticulture. Yet they are almost entirely unrelated from the viewpoint of the plant. Without the protective and insulating blanket of snow, perennial roots and annual seeds which lie dormant in the soil throughout the winter, to reappear in spring, would be killed by the severe frost of the northern States and Canada. Within the loose porous layers of snow, much air is trapped. Air is a notoriously poor conductor of heat so the blanket of snow insulates the earth from the fluctuating extremes of the outside atmosphere. Snow has aptly been called the "Poor Man's Fertiliser". It has an affinity for phosphoric compounds. Particularly in the vicinity of cities and industrial areas, snow is laden with elements valuable in soil fertility. In the semi-arid but rich soils of the prairies, melting spring snow gives to the earth the only thorough soaking it receives, and it is on this "bank" of snow that the crop relies for much of its growth.

Frost is injurious to most plant life, parsnips and salsify roots being two of the exceptions which thrive under it. Unexpected frost has caused millions of dollars worth of damage to orchards. As the human race tends to acquire its knowledge the hard way, nature's blows sharpen our thought processes more than her bounties do. It follows that the frost I.Q. of fruit farmers in California, Florida and elsewhere is remarkably high.

Rain, we are told, falls on the just and the unjust alike. Frost has no such simple distribution. The laws governing it are known to a greater degree than those controlling many other types of weather. While a good and a poor lawyer may know law equally well, the skill and acute observation of the former in utilising his knowledge and applying it to the circumstances of the case makes all the difference to the result. So with frost damage prevention. A prominent grower of high-grade fruit told me that his close study of frost formation in his own orchards, extending over a couple of decades, had proved his best insurance. He studied the specialised temperature and frost forecasts which the Weather Bureau furnishes fruit districts, and he also had installed electrical thermometers connected to

alarm bell circuits; most big growers do, but his personal knowledge of conditions on his own land, different for each pocket and slope, represented the real pay off. Furthermore, it added interest and zest and even the excitement associated with gambling skill to spice an otherwise prosaic enterprise.

The study of frost is a fascinating one, and in its pursuit one learns a great deal about other weather factors. Sunshine, radiation and conduction of heat, clouds, moisture, dew, wind, soil aeration, air flows, even the shape and thickness of leaves, all bring influences to bear. The art of frost fighting is also an exciting chapter. Protective methods fall into three classes—the conserving of heat, the adding of heat and the mixing and stirring of air. Powerful fans, smudge pots and smoke screens, water sprinkling, paper caps and bags, guards of lath, brush, cloth and glass are all used.

Like most of nature's phenomena, frost has its beneficial as well as its harmful side. Long before plowing was invented, alternate frost and thaw teamed with the earthworm in breaking up, loosening and aerating closely packed soil, preparing it for seeding and plant growth. The breath of early frost which brings death to some plants puts the enjoyable crispy crunch into celery.

Knowledge of climate and weather can pay cash dividends to the market gardener. Let me tell you how a friend of mine put weather sense to good use. Bill, navigator of a destroyer, had his ship torpedoed one winter night in mid-Atlantic. His injuries, aggravated by exposure, resulted in discharge from the navy, with medical advice that quiet outdoor work was necessary to slowly build up his health. He decided on market gardening. During convalesence he read extensively on commercial gardening problems, studied real estate values and via correspondence, explored for a suitable location. Bill was thoroughly grounded in meteorology so he put his weather wits to work. Having decided on the general locality in which to settle, he started to narrow his search to a few most favored spots, favored in relation to length of growing season, last killing frost date, precipitation and sunshine, storm record, drought periods. All these were tabulated by a series of graphs and curves. Comparison was made easy. Finally Bill carefully checked the record of local weather for the preceding years; this is too often omitted by people who are otherwise weather-wise. Weather usually goes by cycles, several wet years being followed by several dry ones, a warmer than normal series being succeeded by a chilly procession. A run of favorable years usually sees specialised growing venturing into what may be termed weather-marginal lands. When the cycle changes, heavy losses hit the weather stricken acres.

Established on his garden, Bill continued to study the weather. He played for early crops with their high returns, and while he made mistakes his skilled weather sense helped him scoop the market in good years, and hedge against losses in the bad ones.

When Bill selected the site for his house, he startled the builder by his insistence that the house should be unprotected on top of the hill. "Don't you know," he asked his contractor, "that the warm air rises and the cold air drains off?" The builder just laughed, for he thought of the harsh North winds. But Bill told him of the orchardist who wanted to protect his peach orchard in the hollow which was not reached by icy winds. The cold air froze the trees in blossom down there in the hollow while the trees on the hill came through; they were above the cold air bag.

Allis Chalmers Tractor and Subsoiler

Allis Chalmers Mfg. Co.

Subsoiling

By WALTER G. REED

IN Sir Albert Howard's recent article subsoiling is brought to the attention of organic farmers. Many a gardener may not be aware of this method and its implications and we show therefore a few implements and a few implications.

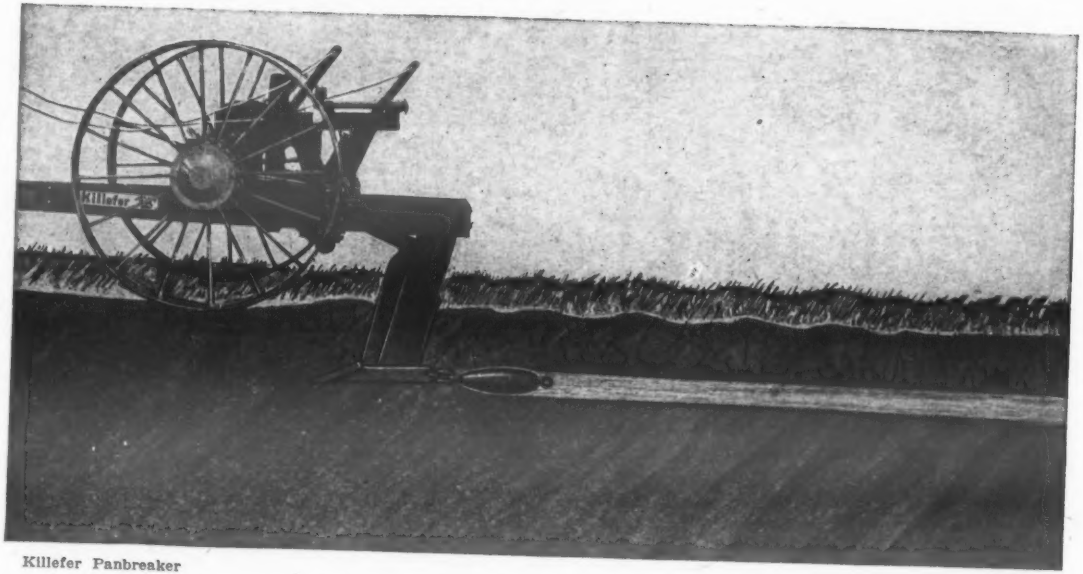
Let us first see an Allis Chalmers Tractor in action! It pulls a *chisel-like attachment* deep below the level of the ordinary plow share through an orchard. In other words, the orchardist has decided to subsoil his plantation. The other picture shows the *effect* of a subsoiler. It shows a Killefer Panbreaker in action. The Killefer machinery is made by another great company of agricultural implements, the John Deere company of Moline, Illinois. You can see how the hard subsoil is crunched up so that air and water can enter, so that the plant roots can penetrate more deeply, so that more soil nutrients can be hauled up to the top.

There has been so much emphasis on shallow soil treatment, the folly of deep plowing, the wisdom of mere harrowing and discing, that the wider public may imagine that a revolution has taken place. This is not so. The majority, the overwhelming majority, of farmers plow because they need to plow. Under certain conditions of summer dryness it has often happened in the past that year in and year out the plow went over the land in the same direction at the same depth. What water seeps down comes to a temporary halt at the plow sole, the foot of the furrows. There the water deposits some minerals from the top soil and then gradually seeps further. Over a period of years, the plow sole becomes cemented by the fine particles washed down to it, and the connection between top soil and subsoil is broken. Such a formation is called a plow pan or a *hard pan.* A pan? Yes, because this insulating hard earth layer acts like the bottom of a pan or bowl, it keeps the water from going deeper. Naturally, it also keeps the roots from penetrating to the lower levels.

What effect does such a plow pan have on growing crops? Quite obviously, it limits them to a small upper soil stratum. Readers of Weaver and Bruner, *Root Development of Vegetable Crops,* now republished in condensed form by *Organic Gardening,* are aware of the almost incredible depths that some plants reach under favorable conditions. If there is a hard pan, on the other hand, the nutrients below the plow sole are lost to the crops because their roots cannot get down. As a result, the plants are weaker and, should a drought hit, become usually a total loss.

It has been a common experience that hard pans form where chemical fertilizers are used and where the organic content of the soil is depleted. Organics are both helpful in increasing the crumbliness of the soil and important to produce aeration and water penetration. Where neither composts nor manures are used, where the soil becomes heavily loaded with minerals, it bakes into a concrete-like mass at the top soil level, especially when it is plowed when wet.

Quite recently it was shown how seriously some fertilizers affect the permeability of soils. Where sodium nitrate was added in bands to truck crops, the permeability of half the fields was endangered, while in some cases it was reduced by 86 per cent.



Killefer Panbreaker

John Deere

The *Journal of the American Society of Agronomy*, November 1945, contained the data as gathered by the U. S. Salinity Laboratory. In other words, such soils puddle and become unplowable directly under the influence of a common synthetic fertilizer. Since the land will, nevertheless, go into cultivation, the well-known plow sole and the ensuing hard pan forms.

"Waterlogging greatly increased the toxicity", says Lady Eve Balfour in relating soil problems of this nature in her book *The Living Soil.* As every reader of Sir Albert Howard knows, and as J. I. Rodale's *Pay Dirt* amply demonstrates with new examples, soils become toxic only where the buffer action of organic materials is overlooked. Thus, the compost method does away with toxicity in two ways, first, through the biologic action of compost and the lime it contains, second, by the improvement of the soil structure which compost produces in that it keeps the soil from getting waterlogged and toxic.

There is yet another aspect, mainly developed by Rodale in *Pay Dirt*, the effect of a non-toxic soil on the earthworm population. If a soil becomes overloaded with acids, earthworms cannot thrive. If earthworms disappear, their cultivation of the soil is impossible. Instead of mixing up top and subsoil, the connection of the upper and lower soil levels is interrupted. This is another means of producing hard pans.

All these dangers of pan formation can be overcome by using compost, because compost increases earthworms, increases balance and does away with toxic substances, increases waterholding capacity and eliminates logging. But before compost can be applied in appreciable amounts, it may be necessary first to break up the separation layer between bottom and top soils, by subsoiling, as Sir Albert Howard suggests.

The effect on the soil is equally bad. When there is a rain, the small amount of top soil, after all just about 8 or 9 inches of plowed ground, becomes soaked and the water stands there souring the soil. Much of the water is washed off and takes soil along. When then a dry period starts, the top soil begins to bake. There is no water column connecting with the water deep down, and the pan becomes really a frying pan.

Looking at the air requirements of growing plants, the situation is very similar to the water requirements. The top layer may, for a short while, have enough air, but then comes the rain and fills the pores completely, then comes the drought and bakes the guey matter tight. Thus all depends on weather conditions—will there be equal rain fall, but not too heavy at any time? If so, even a shallow top soil may yield a good crop. But if there is the usual winter moisture and the following summer drought, then there is more likely a great series of crop failures.

So it went until the pans were broken by mechanical equipment. Naturally, this is not enough. The soil should be enriched organically so that it can hold and absorb more water without becoming a muddy mass or a concrete slab. In addition, nevertheless, there is a need for connecting subsoil and topsoil in order to allow free circulation, to prevent waterlogging and subsequent baking. These subsoil attachments vary according to conditions and depths required. You go two inches deeper and you need *not double* the power that one inch would require, *but four times* the power. Thus subsoiling must be well planned according to power equipment.

There are even horsedrawn soil breakers, such as are made by Farm Tools Inc., Mansfield, Ohio, or Lynchburg Plow Works, Lynchburg, Va. But for the heavy work in the plains country, much bigger power is needed. John Deere put out an interesting booklet, entitled *Buried Treasure*, and some others on the *Killefer Panbreaker*, while Allis-Chalmers supply valuable information in its list of *Heavy-Duty Tools*. If you have a farm in a

region of alternating climatic extremes, especially a region with a dry summer, subsoiling may be indicated and such information about deeper plowing may be most important for you. It is impossible in one article to discuss all the aspects of the problem, for example the *mole attachment*, which opens a drainage below plow level, but the manufacturers will be glad to inform you about these matters. *International Harvester Company* also has splendid subsoil equipment.

Because of the power requirements involved, subsoiling is not an inexpensive hobby, but a costly necessity that everyone will try to by-pass if at all possible. Yet, many thousands of acres would long be out of production if we had not resorted to subsoiling. The "farm below your farm", the subsoil part of your farm, has been utilized for crop production. Not only the quantity can thus be increased, but also the quality; for a deep soil always produces a healthier crop than a shallow soil in which every plant leads a precarious life. The amount of nutrients hauled up from two or three feet is naturally greater than that taken out of nine inches of topsoil. Subsoiling is therefore to be considered as one of the enterprises which concern the organic farmer most vitally.

Water run-off on 8 degree slope — U. S. Soil Conservation Service

This soil lacks organic matter and has therefore no power to retain moisture for the growing crops.

Organics or Chemicals

By JOSEPH A. GOLDING

TIME and again the question arises: What's wrong with chemicals in plant nutrition? Can't the plants thrive and bear fruit just as well when they are fed artificially with synthetically secured substances, like cyanamid, or with compounds extracted from natural minerals by means of chemical processes? Must they have organics or must their food supply occur in the form of plant or animal matter? Why don't you organic gardeners consider limestone, dolomite and phosphate rock as chemicals? What are you going to do when a deficiency appears, let's say, when boron is missing in the soil?

While we have given many general answers to these questions, especially the most obvious one, that plants have grown under natural conditions quite successfully long before chemicals were thought of; while we have emphasized that natural minerals, such as rock phosphate, lime or dolomite are always permissible since they are not quickly soluble and can therefore not alter the soil and its biological life by a few applications; while we have even gathered many data from experimenters and scientific publications that go to show that plants, as a rule, do not take up elements, but respond to various forms and compounds of elements quite differently, we have never listed and discussed the major commercial fertilizers.

Let us take them up now, one by one, and let us start with the most common chemical fertilizer, SODIUM NITRATE. This substance is made from certain rocks that occur in Chile in regions where few rains occur. Rains would wash out the nitrate. Under the dry conditions ruling along the Western slope of the Andes mountains no such leaching occurs and the minerals can be mined and treated under heat. The nitrate salts are crystallized and bagged. The older methods which used high grade deposits produced a substance that contained considerable amounts of manganese, some potassium, and other impurities. The new method produces a substance over 98 per cent pure sodium nitrate.

Put this material into the soil and see what happens. The nitrogen is immediately soluble in water; it leaches out quickly so that in rainy seasons several applications are being made. Plants get a quick stimulation without having to forage for their nitrogen growth food. The soil gets deflocculated or loses its crumb structure; it becomes therefore less able to hold water. At the same time it changes a soil from acid to alkaline. The residue of soda in the soil is a thing that is important enough in itself. Most plants do not like soda. In the long run, soils could be completely ruined by regular use of this substance. At the same time, heavy and quick plant growth tends to deplete the soil of other elements, especially phosphorus, so that the composition changes radically. From 30 to 1000 lbs. have been applied to the acre of farm land. The heavier the application the greater and quicker the effect on the soil.

The next common fertilizer is

SULPHATE OF AMMONIA. It is a by-product of cokeries and also made synthetically by various processes. Since this substance reacts acid, it is applied to crops that cannot stand alkalinity or on soils that have been alkaline due to crop and climatic conditions. The news item recently coming from California about adding sulfur to the soil to acidify it and to correct its alkaline condition is no real news. Sulphate of ammonia has long been used for the same purpose. As Vickery, Bradford, Leavenworth, and Wakeman and more recently Vladimirow have shown, plants may look alike whether they are fertilized by sodium nitrate or by sulphate of ammonia; but their chemical make-up differs nevertheless, a matter that is of considerable importance in highly susceptible crops. Acid-loving crops, such as water melons, blueberries, and nursery stock, such as azaleas, camellias, etc. have been frequently fertilized with ammonium sulphate. So have lawns and golf courses, oats and barley fields, and especially rye fields and rice fields. All of these crops produce better when they receive nitrogen in ammonia form. But just the same, the soil becomes changed by a chemical; sulfur collects and the bacterial life underground changes, as J. I. Rodale discussed in his recent editorial, entitled A DEBATE, Organic Gardening, March 1946.

By mixing both these substances, you obtain what used to be called Leunasalpeter and what now is sold as AMMONIUM NITRATE. It acidifies the soil and leaves a sulfur residue. From the financial angle, it is among the least expensive sources of nitrogen in chemical form.

UREA, often sold under the trade name URAMON, is sometimes called an "organic fertilizer" by the lawmakers of the states, because with the synthesis of urea modern organic chemistry took its first step into synthesis. Urea was the first synthetically produced organic product. But we oppose the use of synthetics for the reason already discussed: Urea is highly soluble and therefore quick acting. It can rapidly change the soil population of bacteria and, if used in any amount, severely damage growing plants and animals. Due to its high solubility, urea can be leached out of a soil within a few days, leaving the standing crops without a source of nitrogen nutrition. This may make this material, that is inexpensive when considered on the basis of nitrogen units, very expensive, since a number of further applications would be required to keep the crops growing. Urea is changed by certain bacteria almost immediately and the resulting products can destroy seedlings and even the roots of well-grown plants. The way this substance interacts with certain phosphorus fertilizers makes it even more undesirable.

The last of the widely used chemicals is CYANAMIDE. Calcium cyanamide contains about half as much nitrogen as URAMON, but is still very dangerous. It can be used to kill earthworms, weeds, and naturally also other plants. In the latter case, the effect is incidental and undesired and the application is therefore always surrounded by special precautions. Cyanamide is applied several weeks before the seeds go into the ground, because otherwise the seeds or seedlings will be killed right off. The moister the soil, the quicker the reactions take place. In a dry soil, consequently, cyanamide can be extremely dangerous when a sudden rainfall dissolves the application of this substance. Under most crop soils, which are not alkaline soils, cyanamide becomes urea while the calcium in the material may further upset the balance by setting up local alkaline pockets.

There remain several dozens of other chemical fertilizers of various composition and origin, of which SUPERPHOSPHATE has been adequately discussed in several items in the March number. The average farmer or gardener is not likely to come

across these substances in his co-ops or on the pages of the seed catalogues or fertilizer dealers.

The attraction which these synthetic products hold is largely this: It is much easier to apply a bag of uramon or cyanamide than to raise cattle and haul manure and liquid manure to the field. The convenience, saving in labor and costs, and ease of application by seed drills or fertilizer spreaders are perhaps the strongest incentive for the use of bagged nitrogenous fertilizers. The cost is the second attraction, which will mainly be felt by the gardener who can buy a bag of mixed fertilizer and take it home in the car, while he may have to get a truck or a trailer to get manure, if manure is at all available.

The disadvantages are nevertheless obvious: Plants may be hurt by these substances; plants do not grow healthy as they do when they must forage for their nitrogen. Synthetic fertilizers tend to produce shallow root systems and therefore make the plants susceptible to bad weather conditions and weaker when pests and diseases arrive. The soil structure may be changed and, over a period, is inevitably changed. For where such substances are applied, the organic content of the soil is used up rapidly. The bacteria which break down urea will also break down humus. Thus, the physical structure of the soil is altered adversely. And finally, the soil biology is changed. Certain living organisms cannot survive in such saturated solutions as these easily dissolved chemicals provide; other organisms take over. Instead of normal humus formation and even distribution of nutrients a constantly changing test-tube condition prevails. But what else can we expect? These substances owe their origin to the laboratory, not to the natural processes of the land. And the land strikes when they are applied, for the land wants humus and organic materials such as it has received for ages past.

Vitamin A Value of Butter

HELEN FARRANKOP of the Arizona Experiment Station at Tucson made a valuable study about Arizona butter, published as report 74 in May 1945. The vitamin content of the brands was consistently higher than that of two national dairies that also were tested. How large the spread may be can be seen by comparing a high sample with 23,897 International Units of Vitamin A with a low commercial sample, containing only 9,974 Units. It is, of course, known that better pastures and quickly dried, green hay produce a higher vitamin content of butter. A person eating about half a pound of butter per week would get one fourth of his entire vitamin A requirements from butter rating about 17,000 Units, which was the average of the Arizona samples.

This Should Be Explained

By E. H. FAULKNER
Author of "Plowman's Folly"

IN a radio interview some time ago a representative of an important agency of the United States Department of Agriculture said that farmers are removing plant food minerals from the soil sixty times as fast as they are replacing them. In simpler English, when the farmer's crops and livestock are sold they take away from his land sixty times as much mineral as the farmer applies in fertilizers and manures. So far as I know, the statement is true.

The implication of such a summary of our plant mineral balance sheet is that farmers must begin to use far more fertilizers than they have ever used before; sixty times as much, in fact, if they are to maintain at its present level their land's ability to produce crops. It should be explained that the requirement of boosting fertilizer applications does not apply equally to every farmer. Some farmers already use great quantities, while many use none at all. The idea seems to be that those who have never bought fertilizer must begin to do so; that many farmers who buy but an occasional bag must begin to use it regularly; and that those who now use great quantities must continue to do so, and, perhaps, increase their purchases. In other words, the replacement of plant minerals sold off the land requires, according to this government specialist, that the general average of fertilizer use shall be lifted tremendously if crop production is to be maintained.

Now that the import of this viewpoint has been claried, we may proceed to examine some of the new situations that would be created by such action on the part of farmers. First off, the manufacture of fertilizers now is geared to produce the amount now being used. Sudden demand for *twice* as much probably could be satisfied by present equipment and working force at the mixing plants. Possibly present manufacturing plants could even strain a point and deliver *three* times the present annual consumption. It is not conceivable, however, that present plants could produce and deliver sixty times as much fertilizer each year as is now annually used; neither is it possible for present known reserves of phosphate and potash to last indefinitely if mined at any such rate; nor could the farmers of the country pay for any such tonnage of fertilizers if they were produced, even though our known mineral reserves would prove adequate and enough additional plants were constructed to do the job of manufacturing. Possibly the present manufacturing capacity for synthetic nitrogen could keep up its part of such multiplied production, but other constituents come from much more restricted sources.

As to the farmer's ability to buy additional fertilizer on such a scale, it must be said that already the annual fertilizer bill is a sizable fraction of the annual expense on many farms. The potato growers of Maine, the tomato farmers of New Jersey, or the

bean growers of Florida may already be returning minerals in sufficient quantity. But consider average farmers of the country. Is it possible for men who made no profit from 1920 until Europe caught fire in 1939 to increase so greatly their outlay for fertilizers? Even during the lean years many of them have been using enough commercial fertilizers to cancel a handsome profit. Does anyone believe ordinary farmers can multiply their usual fertilizer outlay by five or six to say nothing of sixty—and still successfully fend off the sheriff? Even the sheriff could scarcely believe that. Unless I misinterpret what our friend said in the radio interview, that is about what would be expected of this farmer who during the past quarter of a century has fed the country without taking a penny of profit. It seems time leaders of agriculture took time out to face these facts squarely, and advise farmers accordingly.

When somebody says farmers must replace in the soil every bit of mineral their crops and animals take out of their soil, the statement has the proper ring, certainly. The trouble is, though, that such a viewpoint isn't correct, and never was. Yet, sincere belief in such a theory has created in this country the bank account analogy to illustrate the "facts of life" where plant growth is concerned. Americans have never seriously questioned such a point of view, simply because they are accustomed to thinking about so many things in terms of economics. "You can't get something for nothing" is a very popular proverb in this country, despite the obvious fact that, in the exact sense in which we apply it to our American soil situation, it breaks down when applied to numerous countries of the world where no fertilizer has ever been imported.

The fact that we in this country inherited originally the last known big expanse of untouched soil, and have since "worn it out", does not really constitute an argument; for most farm lands can with relative speed be restored by natural processes to that same original condition of high productive ability. Fertilizers will help speed up the process. The proper use of machinery will speed it up even more. But, even without these aids, many soils of favorable texture will automatically recover high productiveness if simply left alone for a few seasons. All of which means that the soil had not been "worn out" in any ordinary sense of that phrase.

Consider how the earth was originally brought under control by the plant kingdom. The only "soil" available to the very first plants was just like what you can see in the bottom of a well worn erosion gully on almost anybody's farm. That original "soil" was pure crystalline minerals, worn to some degree of fineness by millions of years of exposure to heat and cold, the scraping action of glaciers, the pounding of waterfalls, the milling around of swirling stream water, etc. Wind and weather had ground big stones down to sizes so tiny that some were not even visible in the highest power microscopes men had been able to make before the age of electronics. And, until the first plants developed, this mechanical milling of rock is all that had happened except that that big pond we call the sea had begun to become "salt" because the restless water had started the process of continuously dissolving out of the stone everything it could release to water solution. That process, of course, continues today; and provides in sea water the minerals necessary to sustain every living thing in the vast ocean.

Scientists think life first developed in the ocean, this nutrient solution that separates our continents. And, once life had begun in the sea, only elemental "curiosity", or whatever in primordial life corresponds to that human trait, was necessary to stimulate the first effort to establish a "beachhead" on shore. However we may choose to explain it, that first beachhead was established; and we must not forget that there was neither organic material nor commercial fertilizer available to assist in raising *the*

green flag of vegetation over each conquered square foot of shore. From the fact that plant life originally developed without the helpful offices of organic decay, we know that the "soil solution" in which the first roots fed did supply enough minerals to do the job. *There were then enough minerals; there are today enough minerals; there always will be enough minerals.* The rock mass that forms the base upon which every vestige of life and civilization rests consists of nothing but minerals—a fair proportion of which are necessary for living creatures, plant or animal. So, we can forget for all time our fears lest the race perish for lack of a suitable mineral base for our food supply.

Never again will it be as difficult for plant life to take over land that has no organic matter in it. That first conquest had to be made without the aid of the acids that organic decay supplies; and would have been much more difficult except that the sea water was much more highly charged with nutrient minerals than is most water in our streams today. In the sea such minerals are continually coming from the land to augment the supply; and when the water leaves again by evaporation it can't take along the minerals it brought from the land. So, for the initial establishment of plant growth, sea water of high nutrient content was of special value. Now that plants have covered practically the entire earth's surface, there is no lack of the vital acids necessary to procure minerals from the rock itself, provided sufficient organic matter is supplied within easy root reach of the plants to be grown. And, even on land which is temporarily "out" of organic matter, the supply can be renewed, fortunately, in many soils by the simple procedure of growing a winter crop that will be well supplied with ground water during the cool season; then making proper use of that organic matter to provide the necessary organic acids for growing crops for food or market.

Such, in brief, is the real plant mineral situation for the world—including our own country's poorly managed soil. To our great shame it must be said that the soils of most other countries have been kept on a higher level of production than has been true here.

It is possible that we can teach China something about the mechanical handling of its soils; but it is certain that China can teach us much about maintaining high production either with or without mechanical aids. We have "learned" so thoroughly how to misuse our soil that a century or less has been necessary in most places to overcome the soil's natural tendency to keep itself always clothed with green. On the other hand oriental farmers have used such "poor" management methods that more than a hundred generations of occupancy of the same lands finds it still producing lush crops of high nutritive value. There are places in all parts of the world where land has been mismanaged—including vast areas in China. However, while we have tried always to keep large areas in production, the Chinese have obtained their food supply from areas relatively much smaller per person than is true here. From their surplus land they obtain much of the wood and other vegetation they use for cooking, and for boiling their drinking water. The land from which they systematically take every bit of herbage becomes bare and eroded eventually, so that it might seem to indicate poor land management in that country; but the fact that for forty centuries of recorded history the Chinese people have survived at all means that they have done a far better job with their soil than we have done with ours.

Let's forget most of our current theories about plant minerals, and view realistically for once the procedure necessary to insure health and happiness for the people who must live from the products of our fading soils. Purchased minerals aren't the answer. The development everywhere of soils that can be considered complete in every sense *is* the answer.

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Reader's Correspondence

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PEA SILAGE

Q. We live in the great pea-canning (and freezing) belt of western Washington, and a very large part of the pea-vines are turned into silage by the simple means of stacking it in big square piles, very much like a compost stack. It comes out after a time much like sauerkraut but smells much worse.

The top layer and the sides are not fed to the cows, but thrown aside or taken to the fields in the manure spreader.

Now—what I want to know is this —Will this "spoiled" (or so it is called) silage make good compost?

Will it need be handled in a different manner than if it were spoiled hay? (Since it is already acid.) Will it need lime or more lime than usually used?

It can be had for very little money.

I. R. W., Arlington, Wash.

A. The spoiled pea vine silage can well be used in the compost heap. The bacterial action, which has already taken place, will continue and the acid will be neutralized by the sprinklings of lime while the odor will be absorbed by the layers of earth. There is no need for additional liming, but it will be good to add a phosphatic fertilizer in thin sprinklings. We recommend phosphate rock or colloidal phosphate for that purpose. Of course, some nitrogen carrier such as manure or hoof and horn meal should be added as always. The more the silage is spoiled, the more nitrogen has been lost and must be supplied.

—o—

BLACK SPOT ON ROSES

Q. I would like some information on roses. I want to eliminate the recurrence of black spot. I want to raise vigorous, healthy and abundant blooming plants. Will humus or the proper soil solve this trouble, or some other soil conditioner? I do not want to resort to spraying the plants if I can help it any other way.

T. G., Toledo, Ohio

A. Black spot like most fungus diseases is overcome by proper nutrition. Roses in the wild rarely show such trouble because they grow on soil rich in humus. If you can loosen the soil and dig in compost around the roses and then allow a mulch of leaves to cover the ground permanently, you will in a few years get healthy plants, especially if you take care that none of the infested material remains on the roses.

—o—

POULTRY DROPPINGS

Q. I have 5 acres, 4 acres alfalfa, 1 acre buildings and a large garden of perennials and vegetables. I have about 500 chickens and in the summer until Christmas about 200 turkeys. Naturally there is a great deal of litter and cleanings from the chicken houses. I have been advised by the neighbor farmers that I should not use this material from the chicken and turkey houses on the alfalfa field or the garden, that it is too heating, or too rich, at least for some reason is not good for fertilizer. Last year I had it spread over the garden and plowed in and the garden did not do as well as other years. Should this material be treated in some way before being put on the ground and if so, how? It seems to me that this should be good fertilizer and since my ground is rather heavy with clay, the straw should be good for it. Please let me know if I can use it and if it should be treated, just how.

Mrs. J. B. LaV., Denver, Colo.

A. The droppings of poultry are very rich in nitrogen which causes plants to go to leaves rather than roots or seeds. In order to balance this effect of nitrogen one can apply phosphate rock, but the best method is to compost the litter with the droppings and green material such as garbage, kitchen refuse, green clippings, etc. The finished compost will contain most of the nutritive elements in balanced form.

—o—

FIRST ISSUE

Q. When did the first issue of *Organic Gardening* appear? Do you have a copy left?

C. N. F., Brooklyn, N. Y.

A. The first issue of *Organic Gardening* came out in May, 1942, but we have no copies of this issue.

RATS

Q. Several years ago I started putting garbage in my compost piles, together with lime and earth as outlined in your books. I found that the piles attracted rats, and thus had to discontinue the use of kitchen refuse. Is there anyway of controlling this situation? M. K. Jr., Bryn Mawr, Pa.

A. In a properly made compost heap, a heat of 150° F. to 160° F. is attained in about a week after the heap is established. In that heat, rats would be discouraged. By the time the heap is turned, in about three weeks, the material will be so broken down that rats will seek food elsewhere. Just recently a subscriber from New York State, in inquiring how to get rid of rats in and around his poultry house, mentioned the fact that these rats kept out of his compost heap. By adding lime to kitchen refuse that goes into the heap, the heap loses attractiveness as a source of food.

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HOW TO GROW SUNFLOWERS

Q. I have tried for three years to grow sunflowers. They grow splendidly here but the fall winds always break them off before they are ripe. Last time I grew the mammoth Russian and they were mammoth but not one stood up long enough to ripen.

G. C. T., Northeast Harbor, Me.

A. If sunflowers are planted from east to west in a row and spaced a little closer so that they do not grow to the same height as they would if given ample space, they are more likely to resist our prevailing winds than if they are planted in a row south to north.

—o—

KITCHEN SCRAPS

Q. With respect to using kitchen scraps in the compost pile, does it mean just uncooked meat scraps, or does it mean all the leftovers from the kitchen, cooked and uncooked that usually go into the garbage pail. There would be quite a bit of the latter but not much of the former.

A. Kitchen left-overs can be used, though fat and fatty dish water will not break down easily, but attract fat-eating ants. The latter should, therefore, not be used in the compost; but other garbage left-overs will decay readily, whether raw or cooked.

—o—

SAND

Q. What do you use for dirt in a compost heap, when there is nothing but sand available?

M. E. A., Coral Gables, Fla.

A. Some other reader from Florida just wrote us that she was using Everglades muck. If you use some of that for sprinkling on the compost, a yard should go a long way. You may, however, also use the common sand and add some lime in preference to marl. Sandy soils tend to become acid and marl has very little fertilizing value but tends to increase acidity.

Sand is "dirt" too as long as it has had some plants growing on it. Only pure seasand with no life in it would have no value. As long as the sand contains humus and has a brownish or blackish color it is all right. Should you have only bleached sand it would be advisable to prepare a compost yard for the next season by sowing a green manuring crop on the sandy yard, turning the green material under before it goes to seed and use this enriched sand for your compost heap. Muck soil, diggings of a ditch also would do. What about the wild hyacinths, which are dug out now with a scoop, some soil should stick to them too? For covering of a compost heap peat moss, palm leaves, straw may do in case of absence of "dirt". When you use sand as cover you have to make the slopes of the heap less steep otherwise the sand will gradually slide downward.

—o—

WATER HYACINTHS

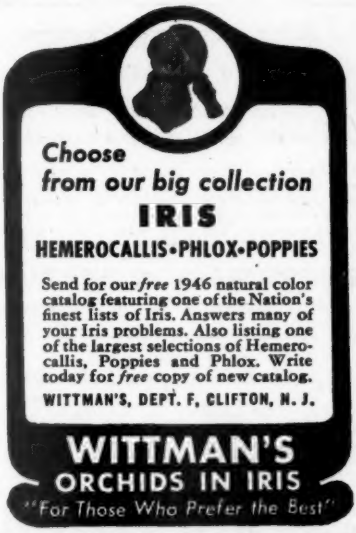
Q. As a new subscriber may I inquire if the plant growth in fresh water lakes or streams in our State would have any value in compost, to compare with that of the sea weed used in England?

Hyacinth and water lilies are considered a pest in some of our lakes and streams, and perhaps these plants can be used to good account, for we need humus here more than anything else.

Your magazine is most interesting, and I hope its subscription list grows substancially.

R. W. G., Gainesville, Fla.

A. Your question is very interesting and I would like to say that Sir Albert Howard made his compost in India largely with such material. Once the water evaporates from pond plants, a considerable amount of valuable plant nutrients remains. If you will put the matter into practice, let us hear about your results.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ORGANIC GARDENING — EMMAUS, PA.

WEEDS AND COMPOST

Q. How can devil grass be used in compost?

C. B., Los Angeles, Cal.

A. The best way of disposing of weed seeds of all sorts and roots that may propagate is by properly mixing the compost heap as follows: Use always one third as much nitrogenous matter as you use green matter. For instance, use two inches of fresh animal manure to six inches of grass clippings, etc. or use a good sprinkling of dried blood or horn meal, or, still better, apply it in liquid form.

The second important factor is that you must build the heap in one operation to the height of about five feet so that heating can take place. You can always put weeds and such material aside until you have enough to build a proper heap.

If you should find that the heap does not heat, you have either not added enough nitrogen matter or not built it high enough. This heat is sufficient to kill all plant life, as was only recently found out again at a leading agricultural experiment station, and as we have found out for many years.

Then the only problem remains to dispose of the outside layers. You can most easily handle that by turning it in or by adding another heap on to the first at least on one side, or by recomposting the outside layers.

If for some reason or other late in fall, you should not be able to build a good heap, you could lay aside dangerous green material full of weeds for use next year. By that time, most of the seeds will have dropped out on the ground and if you build a heap over that spot, the young seedlings will be killed.

—o—

COTTON REFUSE

Q. Normally, I have sufficient material for the many tons of compost I put up every year, but this year

with most everything on a farm in turmoil I find I'm going to be short. To make up this shortage of material can I safely put cotton boll (the semi-coarse, fibrous exterior of the complete cotton boll) in the compost heap? My idea is to mix with animal manures to assure rapid decomposition.

I don't know why this thought hasn't occured to me before since every cotton gin has tons going to rot, but if it will work it will pull me out of a hole. I'll be glad to send you a sample if you should so desire.

W. H. P., Memphis, Tenn.

A. Absolutely, the material from the cotton gin is fine. It is rich in potash and other plant nutrients and will make a fine compost.

—o—

LIQUID FERTILIZER

Q. I wish that I had known of your magazine 10 years ago. I like to ask you one question: If we are feeding a plant liquid fertilizer made from soaking compost in water, what are we feeding, are we feeding nitrogen or nitrite or nitrate? Are we feeding live bacteria or are we feeding dead bacteria in the form of nitrate?

I do not know if you will have time to answer my question but anyway your magazine is worth many times what it costs.

L. H. L., Yakima, Wash.

A. If you soak compost, the water will contain mainly nitrogen and potash and traces of the other plant foods, but you will not have enough phosphorus in this form, since the water soluble phosphorus is very little. This is one reason why bonemeal is so widely applied where liquid plant food is used. Some of the nitrate will be in nitrate form, some in ammonia form. You cannot help getting both live and dead bacteria in such an infusion, besides many protozoa if you leave the solution standing.

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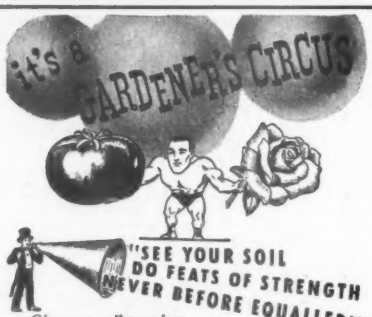

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CONVERT QUESTIONS

Q. I have dabbled more or less with chemical gardening: pitch-lined tanks filled with chemical solutions, covered with hardware cloth or fine mesh wire.

I've fed plant vitamins and watched some things really grow. For instance, Hyacinths and other bulbs.

I now have a small farm of about 32 acres, pigs and cows enough to supply a couple of good loads of animal manure per week and more animals growing.

I'm primarily interested in field corn for grain, so if you know something good along this line I'd like to find it out. I still want all I can get on gardening. I used to live in Pennsylvania. My grandmother and I raised wonderful gardens. We didn't use chemical fertilizers because we didn't have money enough to buy them, I think you've got something. But why compost, not just manure?

G. A. T., Groton, N. Y.

A. The benefit of compost over manure is this. Compost supplies ready made plant food and does not tax the soil bacteria with breaking down the manure. On the experimental farm, we have grown field corn with heavy applications of compost and the size of the ears and total yield has always exceeded that of the best farmers all around.

—o—

MANURE SUBSTITUTES AND FRUIT TREES

Q. 1. In Mr. Rodale's book *Pay Dirt* (page 61) he says that in using dried blood as a substitute for manure in the compost heap one needs only one eighth of an inch instead of the usual two inch layer. Now my question is, will this minute quantity of dried blood produce the same amount of heating as the two inch layer of manure? And will the compost be ready to use in the customary three months time, or will it take longer?

2. Can bone meal be used as a substitute for manure in making com-

post? Will it produce the necessary heating? If so, how thick a layer would you use, and how long would it take to make finished compost with bone meal?

My reason for wanting to use bone meal as a substitute for manure is that in your book *Questions and Answers*, page 14, you state that for fruit trees nitrogen is the least important item and that there should be twice as much phosphorus (and potash) as nitrogen. This led me to wonder how a compost could be made with a greater percentage of phosphorus and of potash than of nitrogen.

W. T. B., Louisville, Ky.

A. Dried blood had best be used in liquid form after being stirred up with water. This will produce quicker action. Bone meal contains too little nitrogen to produce quick heating. If you apply it in liquid form the heap will break down more quickly. Still, it will take at least a month longer than if you used a richer nitrogen material such as horn dust or dried blood. If you make a standard compost which is richer in nitrogenous material you can always apply it more thinly under the fruit trees. You can, however, add potash and phosphorus by mulching the trees and giving an additional sprinkling of bone meal with the mulch.

—o—

COLORS MIXING

Q. Do Gladiolus mix? Must each color be planted separately and stored separtately in the winter to keep the original color?

K. P., Cedar Falls, Iowa

A. The question you ask is very interesting. By growing bulbs side by side, no mixing of colors takes place. Mixtures develop only when two different varieties are cross-pollinated. That is to say when, for instance, the pollen of a yellow gladiolus gets on the stigma of a purple flower. The seeds which might develop would probably produce a mixture of colors, but bulbs are set and cannot be changed.

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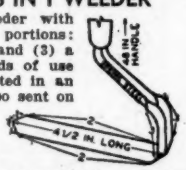

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HAY AND ASHES

Q. Near my garden spot the company has burned a large hay stack, would it be good to take the ashes from this hay stack and spread it over my garden providing it was worked into the soil? The hay was sweet clover, weeds, timothy (wild) and ordinary white clover, with a few other meadow grasses thrown in whose names I do not know. It occurs to me it would be good, but I may be all wrong as I am not up on such things like you folks are.

L. T., Kansas City, Mo.

A. By all means use the hay ashes. What a pity you couldn't make use of the hay in the compost heap before it was burned.

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The Critics Hail

Pay Dirt

By J. I. RODALE

Introduction by Sir Albert Howard

PAY DIRT, *Farming & Gardening with Composts*, which we published late in October, is making a deep impression on America's farmers and gardeners. The critics of farm and garden papers, and critics of literary and general papers and magazines—amateur or professional gardeners themselves — have hailed it as a most important book for everybody to read. Here are brief quotations from a few of many reviews. If you haven't read PAY DIRT you are missing something good.

"Pay Dirt is an exciting and important book both for farmers and gardeners."
—Richardson Wright, Editor,
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"Rodale has certainly hit the bull's eye. His conclusions pertaining to soil management are based entirely upon the fundamental laws of nature, consequently they cannot be other than sound. The book is a clarion call of a new agriculture . . ."
—Joseph A. Cocannouer, noted agriculturist and author of *Trampling Out the Vintage.*

"This is a book provocative of thought and is worthy of study by all who till the soil."
—*Nashville Tennessean,* Floyd Brailliar,
Garden Editor.

"His theories are based on observation and experiment in countries as different as England, India, China, and among various race groups. Everywhere the story is the same, only organic fertilization (compost) can put into our foods what we must get out of them. Should go on the shelf between PLOWMAN'S FOLLY and PLEASANT VALLEY."
Book-of-the-Month-Club News.

"One of the important books of our time."
—*Los Angeles Times.*

"Here at last is a book which brings the all-important world problem of soil conservation into focus for the individual gardener who, of necessity, must think and act largely in terms of his own small patch of ground . . . . Here is an open door to more successful gardening for all who care to enter . . ."
—Robert S. Lemmon in
N. Y. Herald Tribune.

"This will give a good case of the jitters to all backyard gardeners, as well as to all farmers, who have been playing it the easy way by using chemical fertilizers, and it will very likely send them back to the compost heap. It also proves that what you and I don't know about the art of composting not only would fill but has filled a book. The author, furthermore, can keep you up till all hours reading about the life and works of the earthworm, and that is a neat trick."
The New Yorker.

"PAY DIRT, by the editor of ORGANIC GARDENING magazine, is an invitation to agricultural revolution."
—William J. Gibbons in *America.*

"Counting in a recent foxhole edition of *Plowman's Folly,* put out to the troops, that book has had a run of over 500,000. I hope Rodale's book has as great a sale. It is an excellent, provocative piece of work."
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